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TRAINING PRACTICES FOR SURFACE WARFARE JUNIOR OFFICERS

by

William R. Bowman
Alice M. Crawford
William D. Hatch

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NAVAL POSTGRADUATE SCHOOL
Monterey, California 93943-5000

Daniel T. Oliver
President

Leonard A. Ferrari
Executive Vice President and
Provost

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This report was prepared by:

William R. Bowman
Visiting Professor
Graduate School of Business & Public Policy

Alice M. Crawford
Assistant Dean for Faculty Development
Graduate School of Business & Public Policy

William D. Hatch
Lecturer
Graduate School of Business & Public Policy

Reviewed by:

William R. Gates, Ph.D.
Dean, Graduate School of Business
& Public Policy

Released by:

Douglas Fouts, Ph.D.
Interim Vice President and
Dean of Research

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14. ABSTRACT
This research identifies factors related to the effectiveness of Surface Warfare Officer (SWO) junior officer (JO) training. Focus groups conducted onboard 15 ships and at Afloat Training Groups (ATGs) show numerous problems with on-the-job training that frustrate the JOs and concern the senior officers and senior enlisted on board the ships. However, good training practices were found on several ships that should be shared widely. Data also provide input useful for the redesign of the introductory course conducted at the ATGs. Analyses of test scores from the Advanced Ship handling and Tactics (ASAT) are used to develop predictive models of junior officers who may require special attention and/or resources to meet expected goals of qualification and exam tests prior to consideration of their warfare qualification board. These models provide estimates of the impact of factors that raise the likelihood of failing ASAT test scores, including: racial minority and female status, graduation from less selective colleges and non-technical majors, as well as various homeport and ship type assignments along with newly commissioned ensigns not given specific DIVO responsibilities on their first ships. The range of predicted failure rates in these models is extensive. Recommendations for changes to JO training are presented.

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Abstract

This research identifies factors related to the effectiveness of Surface Warfare Officer (SWO) junior officer (JO) training. Focus groups conducted onboard 15 ships and at Afloat Training Groups (ATGs) show numerous problems with on-the-job training that frustrate the JOs and concern the senior officers and senior enlisted on board the ships. However, good training practices were found on several ships that should be shared widely. Data also provide input useful for the redesign of the introductory course conducted at the ATGs. Analyses of test scores from the Advanced Ship handling and Tactics (ASAT) are used to develop predictive models of junior officers who may require special attention and/or resources to meet expected goals of qualification and exam tests prior to consideration of their warfare qualification board. These models provide estimates of the impact of factors that raise the likelihood of failing ASAT test scores, including: racial minority and female status, graduation from less selective colleges and non-technical majors, as well as various homeport and ship type assignments along with newly commissioned ensigns not given specific DIVO responsibilities on their first ships. The range of predicted failure rates in these models is extensive. Recommendations for changes to JO training are presented.

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I. PART ONE: QUALITATIVE ANALYSIS OF TRAINING PRACTICES FOR SURFACE WARFARE JUNIOR OFFICERS

Executive Summary

This research, funded by the Chief of Naval Personnel yearly allotment to Naval Postgraduate School (NPS) for research in Manpower, Personnel, Training, and Education, uses quantitative and qualitative data to identify factors that inhibit and promote the effectiveness of Surface Warfare Officer (SWO) junior officer (JO) training. The study focuses on the period of time between commissioning and becoming SWO qualified.

This section of the report presents the qualitative data analysis that was undertaken primarily to address the strength of the training climate onboard ships. However, because the onboard training, i.e., on-the-job training (OJT) is not independent of other JO training, the research expanded to include data and recommendations related to the current introductory course (Intro) offered by the Afloat Training Groups (ATGs) in fleet concentration areas, and the Advanced Systems and Tactics (ASAT) course offered by Surface Warfare Officer School (SWOS) before final SWO qualification.

During the summer of 2011, the researchers conducted focus groups on 15 ships—six in Mayport, six in Pearl Harbor, and three in San Diego. The ship types included CG (2), DDG (5), FFG (5), LHA (1), LHD (1), and LSD (1). Focus groups included 12 commanding officers (COs), 12 executive officers (XOs), one group commander, and two commodores. Also included in the data collection were 53 department heads, 117 senior enlisted, 145 junior officers, and officers and senior enlisted at three ATGs. Groups lasted from 30 minutes to two hours. The themes extracted from these sessions are summarized here.

Presented here is a sample of the voices from the fleet that represent those who influence the effectiveness of JO training. All findings are presented regardless of resource implications or changes that may occur in the near future for the Intro and ASAT courses. The themes presented are those that emerge most strongly from the focus groups and are accompanied by representative comments. These data represent a current snapshot of fleet perceptions and the strength in which these perceptions are held.

Onboard Training

Requirements placed on ships impact JO training

Senior officers commented extensively on what they judge as excessive requirements placed on ships—many seen as unnecessary—and how this negatively impacts the time available to train and mentor JOs. The other side of the issue is that whatever time is made to train JOs has become one more burden under the current training system that relies heavily on on-the-job training (OJT). Many of these officers view these requirements as oversight from above that amounts to a lack of trust and negative leadership.

There is good training going on onboard some ships, in spite of the many requirements. However, this is not the case on the majority of the ships visited; ships' personnel are stressed, frustrated, questioning the quality of JO training, and—in the minds of some—concerned for the future of the surface navy.

Training culture on navy ships works against good training

With Sailors and officers as busy as they are on ships, many are concerned that SWO training is rushed and has become a check-in–the block rather than a thorough attempt to ensure that JOs acquire the foundations they need to become future leaders. All department heads and senior leaders said they would like to be spending much more time in developing the JOs, and some were more successful than others. Many senior officers expressed concern that we don't have time to train any more but, in the process, are creating a poor culture that will only get worse. One JO said:

We go to the easiest person we can find for a qualification signoff; it's the path of least resistance.

JOs see little systematic attention to their training until someone realizes that a deadline is looming. Basically, they characterize their training as ad hoc and crisis managed. Several comments from JOs included:

Training on this ship is fend for yourself.

My board was put off six times until 5 days before the 18-month mark.

Comments on a poor climate for OJT were linked to ship size/type, a cut in underway days, the ship's place in the training cycle, rigid timelines for SWO qualification, a perceived loss of maintenance expertise due to the closing of the SIMAs, and the difficulty in finding meaningful jobs and time to train extra ensigns. The researchers observed that, in some cases, a poor climate is also influenced by a traditionally tough SWO culture.

JOs want standardized and consistent training requirements and practices

JOs do not understand why those in aviation and submarines (as well as other navy service communities and Marines) are taught to standards while their training has been unstructured since 2003 when Surface Warfare Officer School Division Officers Course (SWOSDOC) ceased to exist. Not surprisingly, they take away the message that SWOs are not as valued as other officers. They note that even Sailors are better trained since they attend Boot Camp and ~~A~~" school. One senior officer said,

We throw them into the deep end of the pool and call that training.

A JO said:

Our Tuesday night sessions are ad hoc—not tailored to the PQS.

JO get training help from other junior personnel

JOs get help in learning their jobs and passing their qualifications from first class petty officers, senior enlisted, the person most recently qualified, and second-tour DIVOs. A concern is shared by many JOs and their seniors that they are learning from someone who has only been in the job 6 months longer and this may represent "tribal knowledge passed down inappropriately." Senior officers ask, "Where's the quality in that"?

JOs on most navy ships visited are demoralized by the state of their OJT

The culture on board Navy ships with respect to training causes JOs to seriously question whether they want to stay in an organization that apparently places little value on their development. JOs know there is a better way to do training and many are resentful about the training they receive. Further, they see some ships "doing it right" and see inequality. They question whether they want to stay with the organization that places little emphasis on their development. Several comments reflect their frustrations:

> *We are bitter because we know there are better ways of doing training than the way the Navy does it.*
>
> *It makes me feel bad that I can't do my job as well as I'd like because of our training.*

There is little mentoring on the ships

Mentoring spreads the burden of training onboard the ships, it's low cost, and it sends a positive message of Navy concern. Yet, very few JOs reported having mentors. As one said:

> *There is no vested interest in our community for mentoring and helping us to advance in our qualifications. It's not like other communities. We do a disservice to our future COs.*

Senior enlisted are concerned with emphasis on "the pin"

Senior enlisted feel there is too much emphasis on getting JOs qualified vs. teaching them deck plate leadership and also feel that they have to pick up too much of the slack for poorly trained JOs, i.e., to the exclusion of their own jobs and training the junior enlisted.

Does the pin mean as much as it does in other communities?

Many thought that the pin does not mean much due to the lack of rigor in the training (and no threat of attrition as in other communities) and expressed concern that the JOs take no pride in earning it and that too many do not aspire to be COs, or even department heads. They wonder how we can best create goal-driven, standardized training and implement good mentoring without making it another check-in-the-box.

Use of the Computer-based Training (CBT)

Only 1 of 15 ships visited required the use of CBT as part of the SWO qualification process; many did not know whether their ships still had this available. Three of 145 JOs had

accessed CBT for some specific aspect of the training. While they felt it was not an easy system to use, they found the content to be useful.

Good examples of best training practices were found on three ships

Good training practices were found that were used underway, but also in port. Some were unique and others such as cross-decking were just implemented more frequently than on other ships. These practices should be shared widely and implemented to the extent possible. Some people had developed extensive training support materials and commented that it would be useful to have a centralized source of such materials, e.g., SWOS, that would also push updates, to eliminate the inefficiency of ships creating their own materials.

Intro Course

Some of the findings from this part of the study validate the changes intended for the Intro and ASAT curricula. They also serve as a partial needs analysis for the redesign of the Intro course.

Many officers and senior enlisted know little about the Intro curriculum

While one senior officer made it a point to talk to his JOs when they returned from Intro (to reinforce what they had learned), most knew little to nothing about the curse. The same was true for understanding the Commander Naval Surface Forces (CNSF) policy on waivers for course attendance**.** Thus, the importance of the course is not appreciated.

The timing of the Intro course is problematic

Now recognized by many, JOs often do not get to the Intro course in time for this basic familiarization course to be useful. As a result, Intro is often viewed as a waste of limited resources.

JOs report on board with few of the skills required to be a division officer

Senior enlisted, department heads, and senior officers are frustrated with the time they have to spend getting JOs up to speed. JOs are even more frustrated; they don‘t like not knowing anything in front of their division. The result is that JOs are demoralized by the lack preparation they are given to assume their jobs; this colors their early perceptions of the Navy as an organization.

Intro should include more hands-on training

The JOs, all other officers, senior enlisted, and ATG personnel want to see the Intro course include more hands-on training that would lead to basic qualifications and, ideally, the course would last longer and be offered en route to the ship. Most frequently mentioned by everyone was a desire for the course to include qualifications in 3M, damage control, and administrative work. Also mentioned often were leadership, ship handling, navigation, the SRFB class, 9MM qualifications, and time management (the key to all that they have to do). There is a desire to

see JOs who are able to do things, not just talk about them; they are significantly concerned about the time it takes to train JOs at the expense of their own jobs.

Skill levels in Intro classes are too diverse

Intro courses have students with a mix of background and experience levels that are caused in part by the timing of the course, and in part as a function of commissioning source. This results in boredom/wasted time for some students, and difficulties for the ATG instructors to teach to such a diverse group.

The chain of command does not know what to expect from new ensigns

Frustration is experienced due to the inability of the chain of command to know what to expect from JOs reporting to the ship and the time it requires to train them. Whereas SWOSDOC had served as a leveling function, the nature and time of Intro interact with commissioning source to create a very non-standard ensign. This issue was also associated with a commonly heard complaint about the training that SWOs receive relative to aviators and those in the submarine community.

ATG instructors are highly motivated to teach the JOs

In spite of being undermanned and teaching the Intro course in addition to their primary mission, instructors appear highly motivated to teach the JOs and desire to contribute their waterfront expertise to the design of the next introductory course. In many cases, and based on their up-to-date knowledge of the fleet, they have created new materials and added new events to the existing curriculum. They continually edit curriculum materials to ensure that they are up to date. ATG personnel would like to lengthen the time for the curriculum (they feel that it is ~~fi~~rehose") and replace PowerPoint with more hands-on training.

ASAT Course

As with the Intro course, some of the findings from this study strongly reinforce the changes proposed for the ASAT course.

Opinions of ASAT are a function of the OOD letter.

JOs who attend before becoming OOD qualified perceive that they learn more than those who already have that qualification. What follows is that the former group perceives more value in ASAT than the latter. This was also the subject of comments from of the JOs, COs, XOs, and department Heads.

ASAT scores are useful

There is appreciation for the information provided back to the ship by the ASAT scores. On one ship, they were used as input to onboard training and counseling. One senior officer commented that they would be more useful if they came to him before the SWO board as this was not always the case.

Conclusion

With changes to Intro and ASAT already underway, the significant value added to JO training may come from changes to the OJT that takes place on the ships. With more systematic attention to OJT, the potential exists for improvement in JO morale and retention of the right officers, as well. More details are provided on JO issues and best practices and recommendations for change are made in the body of this report. In particular, many valuable changes can be made based on the stakeholder input presented in this report.

PART TWO:

QUANTITATIVE ANALYSIS OF ASAT PERFORMANCE

Executive Summary

The major objective of the quantitative section of this report is to determine if already available institutional information on newly commissioned surface warfare officers can be used to construct operationally useful predictive models to improve individual performance aboard ships and in early schoolhouse training programs. It is hoped that Training Officers and mentors aboard ships as well as instructors in the schoolhouse training programs can use this information in counseling and in directing special resources to those most in need of assistance and early enough in the junior officer's career to alter behavior of those who otherwise would fall behind and become disenchanted in pursuit of a career in the surface navy.

The first two parts of the quantitative section are building blocks for the construction of a multiple regression models of individual performance at ASAT. Ten causal factors of ASAT performance are grouped into three categories. The major estimated outcomes of each are as follows:

Demographics

- ***Age*** . Only those 30 and over (mostly CWOs) have difficulty on many exams
- ***Race***. African-Americans and Hispanics face serious challenges on exams, while African-Americans face additional hurdles becoming OOD/U qualified.
- ***Gender.*** Females perform similar to males except in initial SWO Fundamentals exam covering initial shipboard experience, suggesting need to better acclimate them early in careers.
- ***Marital Status.*** In general, not found to be related to shipboard or classroom training.

College Experience

- ***Military Training***. Only impact found is in OCS graduates having greater difficulty in acquiring OOD/U qualification, and surprisingly no significant impacts found in performance at ASAT.
- ***Civilian College Selectivity***. NROTC and OCS Graduates of most selective colleges often do better on exams and those from less/non-selective colleges do worse than Academy and others from moderately selective schools. Results support incentive program of OCS recruiters to focus on better quality schools.
- ***Undergraduate Major***. There is evidence that engineering majors (not so much other technical majors) do better on exams, but there is no difference found on shipboard training (i.e., OOD/U qualification).

Navy Experience

- ***OOD/U Qualification.*** The acquisition of this important shipboard qualification is the single most important causal factor to ASAT performance. All officers should be required to obtain this PQS prior to ASAT. Those finding the greatest challenges include: African-Americans, OCS graduates, CWOs, and those attached to amphibious and smaller ships.

- ***Duty Station.*** Those based in Japan/Guam are more likely to get OOD/U qualified. Owing mainly to self-selection, those based in San Diego achieve highest performance at ASAT, while those from Norfolk the lowest.
- ***Ship Type.*** Officers selecting major combatants, especially destroyers, achieve better performance in ASAT than those choosing amphibs and other smaller naval vessels – although differences in acquiring OOD/U do not seem to be affected by ship type.
- ***Department Assignment.*** Very little importance seems to be attached to the major department aboard ships regarding OOD/U qualification or performance in ASAT. One major exception is found with those not assigned a major department who face far greater challenges in ASAT but are as equally likely to qualify OOD/U.

The last section of the quantitative report uses the above regression models to build forecasts of ASAT performance in the SWO Fundamentals exam, which covers material that all junior surface warfare officers should know from their first 18-24 months of duty aboard their ship. This forecast model is instructive in that we show it is possible to better identify officers who most need assistance in learning material presented at ASAT, and can be extended to other exams and even shipboard performance as officers acquire various PQS qualifications. Three major outcomes characterize this forecast model.

- *Forecast models provide a wide range of estimates of those requiring special assistance*:
  - Those with strong pre-commissioning backgrounds have extremely low probabilities of failing (2% - 4%)
  - Those with weak pre-commissioning backgrounds have extremely high probabilities of failing (50% - 70%)

- *Individual choices, selections, and assignments together have dramatic impacts on ASAT performance*:
  - Demographics – especially race
  - College Experience – especially the selectivity of those attending civilian colleges
  - Navy Experience – especially OOD/U qualification and duty station-ship type selections

- *Forecast Models can be used aboard ships and in classrooms*:
  - Training Officers and self-appointed mentors can use predictive models as part of their tools when discussing individual performance aboard ships and in preparation for classroom schoolhouse training programs
  - Instructors at schoolhouse training programs can use predictive models to help direct additional support services to those most likely to need assistance

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PART ONE:

QUALITATIVE ANALYSIS

Introduction

This research, funded by the Chief of Naval Personnel yearly allotment to Naval Postgraduate School (NPS) for research in Manpower, Personnel, Training, and Education, uses quantitative data to identify factors that inhibit and promote the effectiveness of Surface Warfare Officer (SWO) junior officer (JO) training. The goal is to collect information to improve the training for JOs who have been impacted by the changes made to the training since the end of the Surface Warfare Officer School Indoctrination Course in 2003.

Previous research at NPS has tracked the some of the impact of the changes to JO training (e.g., Bowman & Crawford, 2009, and Crawford, 2010). The present study focuses on the period of time between commissioning and becoming SWO qualified.

The qualitative data focuses primarily on the strength of the training climate onboard ships. However, the research expanded to include data and recommendations related to the current introductory course (Intro) offered by the Afloat Training Groups (ATGs) in fleet concentration areas and the Advanced Systems and Tactics (ASAT) course offered by SWOS before final SWO qualification. It was not possible to focus solely on onboard training because it is not independent of the ATG and SWOS courses. Of course, many other variables influence the effectiveness of JO training such as OPTEMPO, ship type, and commissioning source; these variables are addressed here, too.

During the summer of 2011, the researchers conducted focus groups on 15 ships—six in Mayport, six in Pearl Harbor, and three in San Diego. The ship types included CG (2), DDG (5), FFG (5), LHA (1), LHD (1), and LSD (1).

Focus groups included 12 commanding officers (COs), 12 executive officers (XOs), one group commander, and two commodores. Comments from these officers are referenced throughout as being from ~~-s~~enior officers." Also included in the data collection were 53 department heads, 117 senior enlisted, 145 junior officers, and instructors and senior enlisted from three ATGs. All groups were told that there would be no attribution by name or ship, rather, themes would be extracted from the data and reported by rank. The questions asked in the interviews are shown in Appendix A.

As noted above, the study expanded beyond the strength of the training climate on ships to include the courses that bookend that training—Intro and ASAT. The study, then, addresses the variables that influence the training climate for SWO JOs from the time they are commissioned to full SWO qualification.

Presented here is a sample of the voices from the fleet that represent those who influence the effectiveness of JO training. All findings are presented regardless of resource implications or changes that may occur in the near future for the Intro and ASAT courses. The themes presented are those that emerge most strongly from the focus groups and are

accompanied by representative comments. These data represent a current snapshot of fleet perceptions and the strength in which these perceptions are held.

Analyses

Onboard Training

The training on board the ships visited ranged from ad hoc to exemplary of best practices. However, one theme was constant throughout --the requirements placed on ships, decreases in manning overall but with an increase in the number of ensigns on board, a decrease in the number of underway days, a perceived loss of expertise in maintenance, the ship's place in the training cycle, and a rigid timeline for getting JOs qualified have made it very difficult to do good JO training and mentoring. The quality of the JO training that takes place on ships was questioned by many. Improvements in Intro and ASAT will help enhance JO training, but OJT will still be required and—with the current pace of operations onboard ships—there will still be problems with JO training.

Requirements placed on ships impact JO training

Almost all comments other than those from JOs were offered in the context of the many requirements place on ships—many seen as unnecessary—and how this negatively impacts the time available to train and mentor JOs. The other side of the issue is that whatever time is made to train JOs has become one more burden under the current training system that relies heavily on on-the-job training (OJT). As will be seen in the data analysis, there is good training going on onboard some ships, in spite of the many requirements. However, this is not the case on the majority of the ships visited; ships' personnel are stressed, frustrated, questioning the quality of JO training, and—in the minds of some—concerned for the future of the surface navy. As one senior officer said:

> *There are so many more requirements now, for example, reports that repeat the same things and requirements that don't seem useful to anyone on the ship, for example PROBOOK. And we can't delegate as much due to optimal manning.* **Note**: there were many negative comments about PROBOOK from the JOs as just ~~o~~ne more thing to do." It's interesting that no one understood the purpose of PROBOOK, which likely would have eliminated all complaints.

With changes to Intro and ASAT already underway, the significant value added to JO training may come from changes to the OJT that takes place on the ships. These changes will be more difficult because they rely in part on cultural changes and in part on the awareness of senior officers of the serious need for such changes--in spite of how busy they are with the many requirements that are placed on them outside of JO training. The researchers took away the strong message that frustration could be decreased and training quality increased by such changes. With more systematic attention to OJT, the potential exists for improvement in JO morale as well.

Training culture on Navy ships works against good training

Traditions may not be valued by all. The SWO community is used to doing more with less and being a tough culture. Undeniably, there is value to the culture for supporting a mind-set that is useful for long hours, hard work, and deployments. When this culture is applied to training, it can be played out in ways that don't support either effective or efficient training and cause JOs to seriously question whether they want to stay in an organization that apparently places little value on their development. For example, the value of asking a JO to "find the solution" can range from excellent learning to what is seen as a ridiculous waste of precious time depending on the nature of the task.

There was a lot of discussion at all levels on how much guidance JOs should receive for their OJT. What some saw as spoon feeding, others saw as a lack of standards and goals. The issue is also worth considering in light of the changing values of the young people entering the service who may be less accepting of some of the traditions of the surface navy.

We throw them into the deep end of the pool and call that training. (senior officer)

There is no vested interest in our community for mentoring and helping us to advance in our qualifications. It's not like other communities. We do a disservice to our future COs. (JO) **Note:** few JOs reported that they have mentors.

We need more of a training mentality; *the value of training others should be incentivized.* (JO)

Have we evolved to a check-in-the box mentality toward training in the SWO community? With people as busy as they are on ships, many are concerned that training is rushed and has become a check-in–the block rather than a thorough attempt to ensure that JOs acquire the foundations they need to become future leaders. All department heads and senior leaders said they would like to be spending much more time in developing the JOs, and some were more successful than others.

People don't take quals seriously; it's a check-in-the block. (JO)

Training on this ship is fend for yourself. (JO)

The focus of training in the Navy seems to be on check the box vs. getting it right; whatever it takes to make the ship look good. Same with the qualifications; get them done fast. (JO)

We look to the easiest person we can find for a qualification signoff; it's the path of least resistance. (JO)

We have lost the ability to self assess and we see it in deck plate performance. (senior officer)

Training has been streamlined for efficiency and we've lost quality. (department head)

There is no accountability for ensuring that you understand the PQS; they just sign it. (JO)

Work comes first, quals come second. This is not what we were led to expect. (JO)

The DIVO goal is to leave the ship with the SWO pin so we are set up for check-in-the-block instead of the well-rounded officer and war fighter. (senior enlisted)

We feel the time pressure. Millington wants them ready to roll to their next jobs so they need to be qualified. (senior officer)

Training is given the lowest priority onboard. (JO)

Quals are done by crisis management. A year into it they see we're behind and then blame it on us. (JO)

With no dedicated training, there is no pride; we're just going through the motions…everyone pulls on you. What are you supposed to do? (JO)

The harsh reality is that mission is first and that training is sometimes put off. (senior officer)

My board was put off 6 times and finally happened 5 days before the 18-month mark. (JO)

The pin does not mean as much as it does in other communities. They are going to get the pin eventually. (JO)

In the aviation community, there is an ever-present threat that you won't make it. In the SWO community, there is no threat of attrition—this is wrong, we should be more rigorous. No child left behind doesn't cut it. They should feel good about it [earning the SWO pin]. (senior officer)

The same opinion was offered by some with respect to ship exercises:

We're checking the box in completing a drill. You have to pass at a certain level. If not, you have to rerun the entire thing so you just say „good enough." It's the same thing with quals. (JO)

Commenting on the culture in the Navy in general, one senior officer said:

The young people deserve and cry out for leadership and it's not a waste of time to try. We're making corporate decisions in the surface navy. We've forgotten who we are—what made us great…we've lost the fun and the camaraderie.

Another senior officer said:

We are not passing down the fun aspects of our culture. Everything is negative management; don't do this…where's the motivation in that? The JOs see it, along with the long ours put in by their seniors, and they don't like it.

Structural constraints. The training culture is driven in part by the Navy's organizational structure including organizational requirements and ship size/type. There were more *difficulties seen on frigates, which were attributed to manning issues.*

It would be good to have single longer tours. They learn this ship well then have to go right off to another type of ship and learn again. We don't get enough return on investment. (senior officer)

The DIVOs get moved around too much on the ship; it's the „DIVO shuffle." We have to keep training their replacements or pick up the slack because there is no one to replace them. (senior enlisted)

JOs get scattered everywhere so they don't know their jobs. (senior enlisted)

One of the difficulties in port of doing JO training is that the JOs are off at so many different schools—it's hard to get them together at one time.(senior leader)

With respect to other structural concerns, many talked of the difficulties imposed by a cut in underway days, the ship's place in the training cycle, and the difficulty in finding meaningful jobs and time to train extra ensigns.

Another aspect of the culture that drew mixed opinions was whether or not there is a stigma for a CO to write a letter of Failure to Attain. Some of the senior officers interviewed said that was definitely not the case, and others said it definitely was. One commented that the SWO pin would have far more meaning if ~~n~~ot everyone got it."

With all the same pressures of other ships, some managed to do better training than others. Clearly, they had a stronger training culture than others as the value placed on training was reflected at all levels of ships' personnel.

They put me through the training. There was an outstanding, organized training plan and we did training 2-3 times per week. The chiefs and everyone knew that was how it was. (JO) **Note**: this was training done in port.

There are choices on how a ship prioritizes training. (JO)

In particular, good examples were heard of formal, dedicated training time while underway and in port, and these are discussed in a subsequent section of this report.

Such issues are difficult to sort out but this aspect of the culture may impact retention when the economy improves and certainly impacts JO satisfaction.

JOs want standardized and consistent training requirements and practices

The JOs want standardization and consistent requirements in their training. These comments were often made in the context of how this is in place for aviators and submariners. Why not for SWOs?

They would also like more standardization on their SWO Boards. Many said that they have heard that getting qualified on one ship may not meet the expectations of the CO on the next ship.

Further, JOs on one ship noted that they were all getting dinked on the same qualifications at the same time and wondered why training could not be organized around those particular qualifications.

Our Tuesday night sessions are ad hoc—not tailored to the PQS. (JO)

You think you're ready for the SWO Board and you ask each department head what you'll need to know and they'll tell you but you don't always know what to ask. You don't want this to turn into „stump the chump." (JO)

You're in a military culture that demands structure, but we don't have it in our training. (JO)

The process is so flexible, there is no process. (JO)

Could there be classes, say once a week after INTRO with those dedicated instructors at ATG? There must be other ways to do in port training.

No one really thought he was unprepared until it was too late because no one was tracking his progress. (department head)

The SWO Tracker is helpful when used correctly. On this ship it is just a „wall of shame." (JO)

Use of the SWO Tracker is sporadic (JO)

We have all these instructions and standards for everything on ships, like INSURV. Why don't they train us to standards? (JO)

Why can't we be trained like aviators, marines, or submarine officers? We should all come out with a standard baseline like these guys. (JO)

On those ships where training was less ad hoc in port, JOs were appreciative

JOs get training help from other junior personnel

JOs get help in learning their jobs and passing their qualifications from first class petty officers, senior enlisted, the person most recently qualified, and second-tour DIVOs.

Department heads, XOs, and COs would like to be doing more training but feel that they don't have time due to the many requirements levied on the ships—especially in port.

> *We may end up learning from someone who has only been in the job 6 months longer than us. It's tribal knowledge passed down. (JO)*
>
> *The JOs get tribal knowledge passed down to them by other qualified or second-tour DIVOS. Where's the quality in that?* (department head)
>
> *We've cut manning, maintenance, etc. We need a critical eye now more than ever before and we don't have time to help.* (department head)
>
> *I'd like to spend the majority of my time training DIVOs; it's just the opposite.* (senior officer)
>
> *The senior watch officer is too busy to help. (JO)*
>
> *What training?* (JO)

That JOs get help from people who may not be giving them the best information is widely recognized and causes many to question the quality of the training received.

JOs on most navy ships visited are demoralized by the state of their OJT

The factors discussed above add up to JOs who are frustrated. Further, they see some ships "doing it right" and are even more frustrated by the inequality.

> *We are bitter because we know that there are better ways of doing training than the way the Navy does it.*
>
> *It makes me feel bad that I can't do my job as well as I'd like because of our training.*

The senior enlisted perspective

Senior enlisted comments were centered around the difficulties faced by ensigns because of all the requirements they face, the lack of time they have to train because of the requirements they (senior enlisted) deal with, and, in particular, their sense that time to train on deck plate leadership has been pushed aside. Many feel there is too much emphasis on "the pin" to the exclusion of more important things.

Another key frustration was the extent to which they have to "pick up the slack" for the ensigns who are always off the ship going to schools yet are still so poorly trained.

> *Our time to train them is greatly truncated and varies with the schools they have to go to for different jobs. We're stretched so thin. Should I have to teach him his whole job? We're already picking up slack above and below because of manning. If I'm spending more time training DIVOs, I'm spending less time training the enlisted.*

There are critical NEC shortages being filled by less-qualified enlisted because of manning. I need to spend time training these guys, too.

The senior enlisted talked a lot about the many difficulties facing the JOs:

We need to take it easy on these JOs with the collateral duties so they can get their training done.

The JOs who are doing well really get stuck with a lot of collateral duties.

We put so much on them with collaterals, the training cycle, PQS. At what point is anything going to be quality?

I feel sorry for them.

*DIVO responsibilities are too high, e.*g., *ATFP, we wouldn't give an E-4 or E-5 that responsibility, much less a DIVO. Are we expecting too much of them? What is the quality of the person doing the job?*

They get thrown into the deep end and they don't have the life experience for it. They still have the college mindset.

This last comment relates to a theme heard on almost every ship and this was never in response to a direct question but, rather, always volunteered: a concern that there is increased fraternization between JOs and the enlisted due to common preferences, more enlisted having college degrees, they are the same age, and an absence of adequate leadership training.

The department head perspective

The department heads' comments reflected the key themes seen throughout the other interviews and focus groups, i.e., heavy requirements driving out time to train JOs as much as they would like, especially in port; a strong desire for a standard baseline of JO skills when they come to the ship; the difficulty of getting JOs together at one time for training when they come and go from the ship so frequently for schools and scheduled events; the difficulties of decreased manning; and a description of the best practices they have seen (described below).

Those department heads who had prior service commented on the impact of the closure of the SIMAs (as did senior officers). With the closure of the SIMAs, maintenance work was contracted out and a teaching capability was loss. The result, many believe, is a degradation in the maintenance skills of the enlisted, and chiefs' mess. This, of course, has direct implication for the work of the JOs.

We used to call the SIMA when we had a problem. There was a lot of expertise there and someone would come right over and work with our guys on fixing the problem; we learned from them. Now we call for a tech assist, they fix it and leave. It takes longer to get them here, too. Not only that, there is more paperwork to make this happen. We need to bring back the SIMAs so we will have more self sufficiency. (department head)

The enlisted techs have been impacted by outsourcing of the maintenance because they are no longer doing it. (department head)

Tech reps are often former chiefs. We just pay them more now. (department head)

When SIMAs were shut down, we lost expertise. (senior officer)

The senior officer perspective

Senior officers' comments reflected the key themes with additional concerns offered by some for the future of Navy leadership. These officers commented on what they see as excessive requirements and oversight from above that are placed on them, which they see as amounting to lack of trust and negative leadership and directly affecting the time available for JO training.

They also commented on some bigger picture issues such as skill loss from "Perform to Serve," and the closure of SIMAs, which adds to their concerns for the Navy's future. They were very concerned overall about the JO training pipeline.

One senior officer was an exception. He said,

I will make it work with whatever SWOS model they implement.…I can train them.

There are so many people who are hardworking and loyal to the Navy who are trying to make a very difficult system work. Should they have to deal with so many limitations? Good organizations realize the importance of good training—ultimately for good performance but also for the positive expectations it sets about the organization. As one senior officer noted:

Our current system is set up for failure.

Senior officers were the primary source of comments about best practices in JO training they had used and seen over the course of their careers. We turn to those next.

Best Practices

Most ships reported at least one day of training for JOs while underway; the quality of the training was better on some ships than others but there were good examples of best practices that should be shared.

Training in port, of course, is much more difficult to accomplish due to the many requirements placed on the ship, but there were good examples here, too.

Where notably good training existed, it was appreciated by JOs and the value placed on training was undersood throughout the chain of command.

Cross decking. Cross decking, already done by most, is certainly a best practice. Many of the senior officers interviewed discussed cross decking. This was frequently mentioned as a way to help ensigns get qualified while in port. While most see this as a valuable tool, some expressed concerns that their JOs might pick up bad habits or be treated as "less than…" in

favor of the ship‘s own ensigns. On the other hand, one senior officer mentioned that he had let another ship do the OOD qualification for one of his JOs.

Another concern was that cross decking adds to another ship‘s problems since they have extra ensigns, too.More frequently, however, people valued cross decking. In Pearl Harbor many positive comments were heard about this being easy there because it is such a small, close-knit waterfront, (Another example of this is that the XOs communicate daily.)

> *We just got back from deployment and took 5 ensigns from [another ship] on board. We gave them meaningful jobs and welcomed them to the wardroom tight waterfront. We lend out our people all the time, e.g., another ship is short a QM so we send ours over almost daily.*

Scheduled, systematic training. JOs appreciate regularly scheduled, formal (vs. ad hoc) training, especially where the department heads and more senior officers are involved.

One ship conducts training Tuesdays and Thursdays while underway. These classes were taught by department heads or second-tour DIVOs. Many ships reported at least one day of training while underway, some more systematic than others. On another ship, the senior watch officer had weekly one-hour lectures planned 4-5 months in advance for both underway time and, with more difficulty, for in-port training.

Another department head is putting together a formal program for JO qualifications but which will also focus on DIVO jobs. This program will be used underway.

A ship that we did not visit but heard of and subsequently contacted has a very formal plan that should be shared widely. This plan is attached in Appendix B.

Training plans. Several instances were heard of a qualification progression letter put out by the senior watch officer that laid out everything required with very clear goals and expectations.

There were also several instances of creating dedicated training time when the JO first reported on board and this was done instead of giving them ~~“m~~meaningless jobs” that they don‘t feel good about.

> *Let them work on their qualifications so they feel good about themselves.* (senior officer)

On one ship the TrainO was a first-tour division officer. The JOs appreciated this because they said the TrainO was still close enough to their situation to really understand how to help them with the structure they need for their training.

Another senior officer said to a JO,

> *Your job is to learn the ship for the first month; learn the people.*

Tailored training. One ship trains on a topic per week while underway and works on it until all the JOs are qualified. These sessions are taught by chiefs or whoever is qualified and they make their own PowerPoint to use.

One senior watch officer uses test scores from ASAT as feedback for designing the SWOU curriculum and for counseling weaknesses.

Many ships use the watch bill as a training tool.

A formal murder board before the SWO board was appreciated by the JOs.

In one case, the DIVOs themselves try to get together for an evening a week and get a chief to talk to them on some topic.

A culture for training and assessment to reinforce the training. Two ships reported extensive debriefing of major ship events in the wardroom as a training opportunity. On both of these ships, the culture supported honest assessments of their performance—good and bad—where open feedback, and thus good training, was promoted. "We've broken the code here on not saying bad things. A senor officer said:

> *A climate of honest assessment comes from a willingness to learn. We are honest and brutal; we don't varnish the truth but it's not pointed, either. We do a reasonable job of calling ourselves* out *to set a good example. We need to learn to call ourselves out. If I do it, it's a stick, if you do it, it's a carrot. You must be able to see your own failure. We don't secure from any event until the debrief is complete.*

Further, this same ship approaches the feedback from a systems perspective, i.e., addressing the effects of given events throughout the system and they fit into the bigger picture. Included here are mission area briefs with one coordinator for each area where the JOs can listen and hear what is important to their ship now and in the future. Similarly, all department heads are brought to the bridge for major evolutions since they will become XOs next.

Similarly, another senior officer makes it a practice of never being first to speak first in a debrief so that no one is intimidated by what he said. He finds that by the time it is his turn to speak, most if not all of the things he would have said have been mentioned and he sees this as very positive. He said:

> *It's a great training tool. They listen to what everyone says and don't want to make the same mistakes.*

One senior officer commented that debriefings take place on other ships but they are not necessarily common, especially with the supporting culture they have created.

The first senior officer mentioned in this section further promotes learning by having department heads share staterooms with a first-tour DIVO who is not in their department. The result is that unofficial mentoring takes place. This seems particularly important in that few mentoring relationships were reported across the many JOs interviewed.

The same senior officer has formed a process action team with membership from all levels, including new JOs to look at JO training ~~fr~~om soup to nuts. They will deliver a product and they will all have buy in." This sends yet another message to all that training is valued.

Another senior officer said that he conducts training every week for the JOs, including those who are qualified. He makes it fun by using movies or books for discussions. This same officer said that you should use every opportunity to teach and mentor including, ~~j~~ust go down and talk to them."

Last, one senior officer implemented active mentoring by all 1110s for new JOs.

The impact of training resources

Comments were made about training resources that, if addressed, have the potential to improve OJT.

The Navigation Trainer. There were several comments that the simulator on board ship was either ~~u~~seless" or ~~n~~ot working." However, we learned later that only one ship had learned how to use it.

Materials. There were any number of examples of people on ships creating training for the JOs but all had to seek out or create materials to support the training. Many comments were made about the desirability of having SWOS push materials for onboard training.

Why is everyone designing their own stuff to train JOs? (department head)

I would like to have training materials sent to us but not mandated by SWOS. (senior officer)

One suggestion was made to create materials for IPADs that would include every reference one would ever need. It could be centralized at SWOS where new updates could periodically be pushed out.

We should move to new media that the JOs use. (senior officer)

JOs would like some kind of study guide for their qualifications. They note that while the PQS has all the references, they want something that's easier to go through so that time is not wasted.

Intro

Some of the data collected concerning the Intro course tend to validate the changes that have recently been proposed for that course. However, other changes to the course are suggested in the data that are worthy of consideration. Effectively, this part of the study can serve as a needs analysis for the design of the new course from the perspective the customers of the course—the JOs, their department heads, the XOs, the COs, and the senior enlisted.

Many officers and senior enlisted know little about the Intro curriculum

Surprisingly, many officers and senior enlisted knew little about the Intro curriculum. While one senior officer made it a point to talk to his JOs when they returned from Intro (to reinforce what they had learned), most knew little to nothing about the course. The same was true for understanding of the Commander Naval Surface Forces (CNSF) policy on waivers for course attendance. For example,

> *JOs aren't touchable while they're in Intro and they're doing nothing here.* (senior enlisted)

> *Some COs want the JOs to come back to the ship during Intro and it creates an awkward situation for the JO.* (senior officer)

Negativity and frustration could be avoided if everyone knew what was in the course and the importance of the course.

The timing of the Intro course is problematic

Due to the majority of JOs being commissioned in June, and the need to level load the Intro course, many JOs do not attend the course early in their first ship tour. If they have to meet their ship on deployment, reporting to Intro is further delayed and the basic familiarization provided by the course loses value.

Many from all ranks said that—to have value—the introductory training must take place en route to the ship. But, if they are onboard too long before the course, they may not need it and it may take them away from valuable training time such as underway time. All felt that any underway time is more valuable than Intro where there is a choice.

Many—especially the senior enlisted—feel that whatever training rhythm they can establish is disrupted by the ensigns leaving the ship for Intro and the many other schools they attend. Further, a delay in INTRO is particularly difficult for the JO who already has a division. DIVOs do not want to abandon their divisions for 5 weeks so they don't, in spite of the policy of dedicated training time for Intro. It is also difficult for the senior enlisted who have to pick up the slack while the JOs are gone.

> *Intro works well when it takes place right after they get to the ship.* (senior officer)

> *Senior enlisted are getting pulled in more directions than before with PTS, fewer people, and more inspections and requirements. We need to share the training load. If the JOs can do stuff before coming here, then we can train on the equipment. (senior enlisted)*

> *All the training off ship is painful for those left behind and those who are left behind may be missing valuable training time on deployment. (JO)*

> *It's 3-4 months before they're functional; do it before they get here.* (senior officer)

JOs report on board with few of the skills required to be a division officer

Similar to the experience with the SWOS-at-Sea training, there is frustration all around with junior officers reporting on board with few of the skills required to be a division officer. As many of the comments above indicate, senior enlisted, department heads, and senior officers are frustrated with the time they have to spend getting JOs up to speed. JOs are even more frustrated:

I didn't like not knowing anything in front of the division. (JO)

Enlisted come better prepared than ensigns because they have boot camp and "A" schools. (JO)

One department head commented on the difficult and sometimes emotional conversations he has had with JOs who are angry at being expected to do things they were not trained for. Although, he said, ~~–~~some will embrace it as part of the SWO process."

Intro should include more hands-on training

The JOs, all other officers, senior enlisted, and ATG personnel would like to see the Intro course include more hands-on training that would lead to basic qualifications and, ideally, the course would last longer and be offered en route to the ship. Their comments offered suggestions for content, but also addressed the impact of JOs not having the skills they mentioned. Most frequently mentioned by everyone was a desire for the course to include qualifications in 3M, damage control, and administrative work. Also mentioned often were leadership, ship handling, navigation, the SRFB class, 9MM qualifications, and time management (the key to all that they have to do).

Baby SWOS is knowledge; we need skills. (JO)

They need to know how to *DO zone inspections, spot checks; and write casreps--not just TALK about them. (senior officer)*

They must have the 3M qualification; it is an essential part of their jobs. (senior officer)

We need more on personnel issues like evals and things that impact the enlisted. (JO) Note: this is a comment echoed by many senior enlisted.

Admin isn't the fun part but it's their main role. (senior officer)

They can't write evals, awards, or messages. They have never seen the Navy Correspondence Manual and make ridiculous chops on stuff I wrote that's going up the chain. (senior enlisted)

No one knows how to write a message, so I have to baby sit. When I spend additional time training DIVOs, I give up being good at my job, running a department. Since they can't do these things, I'm doing a lot of the same stuff I was doing as a 2nd tour DIVO. (department head)

An 0-1 is supposed to evaluate a PO3 doing spot checks and he doesn't even know what it is? This is one more thing we end up doing. (senior enlisted)

*We now have useless ensigns who can't become DIVOs right away. We have to show them how to do everything like writing casreps. We are doing far more basic training now when we could be doing more advanced training...tactics and where mission fits in. (*department head)

Many department heads and senior officers commented on the value that would be added by having decommissioned ships or yard patrol crafts in Introductory training to help them understand what to expect on the ship and what it is they are trying to accomplish.

The wet trainer at ATG is fun, wet, cold, etc. if you know what it really means on the ship, you know people could die.

The chain of command does not know what to expect from new ensigns

Frustration is also experienced due to the inability of the chain of command to know what to expect from JOs reporting to the ship and the time it requires to train them. Whereras SWOSDOC had served as a leveling function, the nature and time of Intro interact with commissioning source to create a very non-standard ensign. This issue was also associated with a commonly heard complaint about the training that SWOs receive relative to aviators and those in the submarine community.

We must have some kind of Baseline coming in. What can I expect when they come to the ship? (senior officer)

I would like to see them trained to a very focused standard like Marines at The Basic School.(senior officer)

Three weeks for OCS and 5 weeks of training for ROTC and USNA? Really? This makes no sense. (department head)

The key issue here is the inability to anticipate/create OJT that will support all ensigns.

Sill levels in Intro classes are too diverse

Difficulties for the ATGs in teaching a group of students that has a mix of background and experience levels are caused in part by the timing of the course, and in part as a function of commissioning source. This results in boredom/wasted time for some students, and difficulties for the ATG instructors to teach to a diverse group.

Intro is taught to lowest common denominator. (department head)

USNA and some of the ROTC units teach some of the same stuff we do. (ATG instructor)

Time and resources expended training those with skills advanced beyond the basic level would be better spent in more advanced training or letting them stay on their ships. (Again, the

waiver policy is not well known or understood and many stories were hear from all ranks about Intro being ~~a~~ waste of time.")

ATG instructors are highly motivated to teach the JOs

In spite of being undermanned and teaching the Intro course in addition to their primary mission, instructors appear highly motivated to teach the JOs. In many cases, and based on their up-to-date knowledge of the fleet, they have created new materials and added new events to the existing curriculum. They continually edit curriculum materials to ensure that they are up to date.

Examples of add-ons are situational awareness briefs on factors JOs should be tapped into given their particular AOR, a briefing on the nuclear training path, and qualifications such as the swim qualification and range training that are now expected but were undertaken originally on the initiative of the ATGs.

Interestingly, ATG personnel comments reflect those of others interviewed for this study. They would like to lengthen the time for the curriculum (they feel that it is ~~fi~~rehose") and replace PowerPoint with more hands-on training. They feel strongly that any introductory curriculum should be taught before the ensign reports to his/her ship. They would also like to add segments on how to deal with the unexpected, conflict resolution, how to pass inspections, how to create and present briefings, writing skills, and a more in-depth treatment of the chief-JO relationship.

ATG personnel feel they could benefit from having all ATG critiques put on line for all FCAs so they could monitor trends and share lessons learn. They would also like more advanced simulators such as those that support the aviation and submarine communities.

Even the Army has integrated simulation exercises. (ATG instructor)

ATG critiques show that JOs would like to have brief synopses of every job they might be doing. Instructors suggest that this could be a good candidate for computer-based training since there are so many jobs ensigns could go to; SWOS could push updates for such a program.

ATG personnel further recommend that in the proposed introductory course, SWOS should capture the expertise at the ATG (current fleet knowledge and lessons learned) for the design of the new curriculum. They are hopeful that senior enlisted will be kept in the mix of instructors due to the criticality of that chief-JO relationship, and that any new program will be resourced with the current software that the Navy uses (for example, for navigation).

ASAT

Less information emerged about ASAT as compared to the Intro course and the OJT that occurs onboard ships. However, several themes emerged.

General awareness of ASAT

Once again, researchers were surprised at how many officers and senior enlisted were unaware of the course content of ASAT. As a result, some negative comments from those other than JOs might need to be discounted.

> *They* [the JOs] *say ASAT is a big party. We could have them here doing something constructive.* (senior enlisted)

> *They* [JOs] *look forward to it because it's a vacation; they already know the stuff.* (department head)

Senior Enlisted (and one senior officer) see ASAT as one more instance of Ensigns being off of the ship leaving work behind for others. Several senior officers questioned the intent of ASAT. This lack of awareness of the ASAT curriculum can feed negative perceptions—reality-based or not—that don't help the JOs to advance in their training, and, result in a missed opportunity for other officers to reinforce and support what is learned at ASAT.

Opinions of ASAT are partly a function of the OOD letter

Opinions of ASAT seem to depend largely on whether JOs have already received the OOD letter when they attend. This was observed from the perspectives of the JOs, COs, XOs, and department Heads. JOs who attend before becoming OOD qualified perceive that they learn more than those who already have that qualification. What follows is that the former group perceives more value in ASAT than the latter group.

> *ASAT rounded me out…good to be in a classroom setting with people from different ships. Great networking opportunities.* (JO)

> *ASAT was a waste; there was too much emphasis on ship handling where I wanted more on advanced tactics. I (JO)*

> *I want my officers to have the OOD qualification before going to ASAT. I've seen much better results when this is the case.* (senior officer)

To some JOs, ASAT is in stark contrast to their more ad hoc onboard training:

> *ASAT gets it right. They are very clear on goals and expectations.*

As with Intro, some JOs felt that ASAT taught to the lowest common denominator because of having the mix of students with and without the OOD qualification in the same classroom. A former SWOS instructor commented on the difficulties of teaching to such different knowledge levels.

As with the Intro course, time and resources expended training those with skills that have already been mastered would be better spent in more advanced training or keeping them on their ships.

ASAT Scores are useful

There is appreciation for the information provided back to the ship by the ASAT scores. On one ship, they were used as input to onboard training and counseling. One senior officer commented that they would be more useful if they came to him before the SWO board; this was not always the case. Another senior officer thought it would be very useful to see the scores of his JOs relative to those on other ships.

The scores from ASAT, and presumably the next version of ASAT currently under development, are a potentially valuable training tool that should be used to the extent possible.

Computer-based Training (CBT)

Only 1 of 15 ships visited required the use of CBT as part of the SWO qualification process. Many did not know whether their ships still had this available. Three of 145 JOs had accessed CBT for some specific aspect of the training. While they felt it was not an easy system to use, they found the content to be useful.

The JOs would like to know more than a week ahead that they will be getting tested on the CBT at ASAT. Some mentioned doing group study before ASAT, but they would have liked more time. A senior officer commented on the need for more advance notice as well but this comment was offered in the context of the need for a better link between shipboard training and ASAT.

Recommendations

Onboard Training

● Make SWO qualification a number of underway days to reduce the difficulties of a one-size-fits-all deadline. A formula could be developed by CNSF.

● Create a month of dedicated time for the new JO to get to know the ship, the people, and begin the qualification process. Avoid assigning meaningless DIVO jobs. Ideally, this first month would be under the guidance of a mentor who could provide some guidance, some points of contacts, and answer questions as needed. Care should be taken in assigning mentors as experience documented throughout the literature (across many different kinds of organizations) shows that ambitious mentorship programs involving assigned mentors, usually fail. The mentor should not be overused and should be incentivized by the culture of the ship. This will place more emphasis on quality vs. check-in-the-block training.

● If tour lengths can‘t be increased, minimize the number of DIVO jobs on board for deeper learning for the JO and less impact on the senior enlisted.

● Have a plan in place for every JO. SWO Tracker could be used in conjunction with initial guidance from a mentor or the senior watch officer. A formal plan sends a good message about the value of training.

Murder boards should take place before the SWO board on all ships.

● Tailor the short, on board sessions to particular qualifications that JOs are working on.

● To the extent possible, COs, XOs, and department heads should be involved in training even if that is something as limited as monthly meetings, especially in the early stages of a JO‘s time on the ship. This could go a long way in easing some of the frustrations the JOs feel concerning the low priority training is given.

● Disseminate information on how to use the on-board simulator. For example, an ATG instructor could meet with selected department heads and JOs to talk about the potential value of the trainer.

● Encourage use of CBT for reference and ASAT preparation.

● Create a centralized source of materials for on-board training. Conduct a cost benefits analysis to determine the value of delivering these new materials on a new medium such as IPAD. Collect content that others have developed and build on that.

● Review the leadership week for the new INTRO course to ensure that issues of fraternization and the JO-chief relationship are covered in sufficient depth. A needs analysis might reveal other areas of need change as well.

● The senior watch officer should encourage JOs to take the initiative to identify training topics of interest and he/she can recommend an officer or senior enlisted person to teach the topic.

● Use the watch bill rotation as a training tool.

● Use ASAT scores as feedback into the design of the on-board training plans.

● One senior officer recommended –The Armed forces Officer,” which is an 80-page book that should be required for JOs. Another is the –Division Officer's Guide.” He said these used to be used and should be brought back as required reading.

● Consider the many comments on the loss of maintenance expertise. If these are determined to be valid, consider how they should be addressed.

● Share all best practices through some medium that will be noticed.

● Conduct a thorough review of all requirements placed on ships to eliminate redundancies and ensure criticality.

Intro

● Develop and implement strategic communications to publicize the content and importance of the next introductory course to enable those in the chain of command to reinforce—and support—what the JOs have learned.

● Use a medium for these communications that is not a Navy message or an instruction that is likely to be ignored.

● Execute the proposed timing of the new course to take place en route to the ship. While logistically difficult, this will do a lot to eliminate frustration and improve training quality.

● Listen to fleet input in designing the next course. Consider all content recommendations and ensure the ensigns come to their ships with major qualifications signed off. If desired, the recommendations made in this research for content in the new course could be validated by a very quick survey. The impression of the researchers is that ship personnel would be only too happy to have their opinions heard.

● Design the next course to even out the commissioning source variable to the extent possible. For example, there could be a separate track for Naval Academy officers. Or, ensigns could ~~-te~~st out" of course segments for special instruction or early return to their ships.

● Use YPs in the next introductory course.

● Design the next course to be more rigorous than the current Intro course to send the message that SWOs take their training as seriously as Marines, and the aviation and submarine communities. For example, ensure that some of the exams are not multiple choice (a suggestion made by one of the ATG instructors). Multiple choice tests, while easy to grade, are not necessarily good measures of learning.

● Work with the ATG to capture their expertise and lessons learned in designing the next course.

● Keep senior enlisted involved in teaching the next course.

● Consider using the aviation model for the design of a future course where an officer designated 1160 would receive his/her SWO pin before reporting to the first ship, and then qualify OOD on the specific ship class.

ASAT

● As recommended for the Intro course, develop and implement strategic communications to publicize the content and importance of the next course to enable those in the chain of command to reinforce—and support—what the JOs have learned.

● Use a medium for these communications that is not a Navy message or an instruction that is likely to be ignored.

● Execute the next version of ASAT as proposed such that the skill levels of students will be more even and more can benefit from the training.

● Share exam scores from the next version of ASAT and publicize the value of them to COs for enhancing the value of JO training

● If CBT is used as the basis for the pretest of the next version of ASAT, ensure that JOs know this well in advance of the training.

PART TWO:

QUANTITATIVE ANALYSIS OF ASAT PERFORMANCE

Changing Role of Classroom Training

The role of classroom training in the early development of junior surface warfare officers has changed dramatically since the new millennium. Prior to the fall of 2003 all newly commissioned surface warfare officers were indoctrinated at the Surface Warfare Officer School Division Officers Course (SWOSDOC) in Newport, RI that lasted up to six months. This program was required of all officers regardless of commissioning source. In September, 2003 the navy dramatically altered the training pipeline of its junior surface warfare officers by eliminating the SWOSDOC classroom training and instead sent Ensigns directly to their first ship where they would be trained on-the-job through learning by doing. A series of CDs were issued to each new officer which was a backup for their on-board training, including tests over the subject material relevant to the required Personal Qualification Standards (PQS) they were expected to obtain. At the time, it is believed this change would not only save significant training costs but also shorten the time junior officers become qualified and thus more useful to the ship‘s crew.

Along with this change, Surface Navy instituted a three-week ‗leveling‘ classroom training course called Advanced Ship-handling and Tactics (ASAT) that was scheduled after officers had achieved their Officer-of-the-Deck/Underway (OOD/U) qualification but before they would appear at the ship‘s Surface Warfare Officer Board (SWO Board). This board is composed of the ship‘s senior leadership who provide the final say on whether or not an individual is ‗fully warfare qualified‘ as a junior officer. Attainment of the ‗SWO Pin‘ is the first major requirement in the surface warfare officer training pipeline and all junior officers are required to enroll in the ASAT course offered at Newport, RI as part of becoming a warfare qualified officer.

Due to the irregularities of ship deployments and scheduled ship repairs, mandating the requirement of having the OOD/U prior to enrolling in ASAT was changed in March 2009 and since then roughly 50% of junior surface warfare officers are able to attain their OOD/U qualification before ASAT. This change has resulted in a diverse knowledge base of incoming junior officers as well as affecting the level and scope of instruction at ASAT.

An additional change was incorporated in September 2009, when Surface Navy realized that many newly commissioned officers were not able to acquire the needed skills of a Division Officer while also trying to pass the myriad of PSQs required for qualification as a surface warfare officer. Ship manning levels were made smaller, while op-tempo remained high and in many cases increased over time. These policy changes, among other things, drastically affected junior surface warfare officer training as Division Officers had increased responsibilities and duties as did Chief Petty Officers – all with fewer personnel underneath them to do ‗more with less.‘ As noted in the qualitative discourse, many junior surface warfare officers became ‗the forgotten‘ aboard many ships. To address this critical shortage, Surface Navy reinstituted a shortened version of SWOSDOC, called SWOS INTRO. As noted earlier, OCS candidates at Newport were shuffled into an extended four-week classroom training program at Newport,

while Naval Academy and Navy Reserve Officer Training Corps (NROTC) graduates were sent to a five week waterfront program at selected bases. The personnel attached to a base's Advanced Training Group (ATG) were given a course of instruction used at the Newport INTRO so that the initial training would be similar for all newly commissioned officers. At first, these INTRO courses were offered at our largest naval bases in Newport and San Diego, and later offered in Mayport and Pear Harbor. Currently, Surface Navy is developing a new "INTRO" course to be taught by instructors at ATGs in Norfolk and San Diego. The length and content of instruction are currently under review and development.

For this project, the historical account of the many changes in classroom training for junior surface warfare officers is important because differing tests and exams were given in the various classroom training programs, and often differing tests were designed for a given classroom training program over time. As such, the analysis of test scores becomes rather complicated since there have been so many changes to instruction during this period of transition. Data availability of tests administered as part of the evolving INTRO program is especially sparse as relatively little is known about what goes on in INTRO by the fleet and no information regarding INTRO test scores is made available to ships to which the newly commissioned surface warfare officers are assigned. The test results at ATGs are especially sparse as many were not made operational until recently and others don't have data bases readily available with scores attached to personal data, such as commissioning source, college, major along with demographic data.

As such, the quantitative analysis undertaken in this analysis focuses on the various tests and exams given at ASAT. As indicated below in Table 1, no test scores from the first three years were recorded by ASAT since they were instructed to design a classroom training program in which everyone would "pass' and officers could focus on learning without the threat or fear of intimidation that some would attach to scored and recorded tests. This policy was changed in 2006, during which time three test scores were recorded – Surface Warfare Fundamentals, Maritime Warfare, and Rules-of-Road. The CDs given to each new officer focused on these core competencies and ASAT was a natural classroom setting to examine the knowledge acquired during ship board training as well as new information given during classroom sessions at ASAT. Navigation replaced Maritime Warfare exams in 2010, when a Final exam was also instituted. The analysis given below will cover all these five exams, and will emphasize the Surface Warfare Officer Fundamentals exam as it is the only one given throughout the entire change of instruction at ASAT. It is also important to this study as it covers the material newly commissioned surface warfare officers are expected to learn while aboard ships prior to attending ASAT.

TABLE 1.

Observed ASAT Test Scores by Dates & Class

ASAT Test	Number of Cases	Class Dates		Class Number	
		Start	End	Start	End
None Available	2,073	29-Sep-03	5-Jun-06	158	198
Surface Warfare Fundamentals	4,744	10-Jul-06	6-Jun-11	199	273
Maritime Warfare	3,890	27-Nov-06	1-Nov-10	205	264
Rules-of-Road	4,630	21-Aug-06	6-Jun-11	201	273
Navigation	960	4-Jan-10	1-Nov-10	251	264
Final Exam	514	29-Nov-10	6-Jun-11	265	273

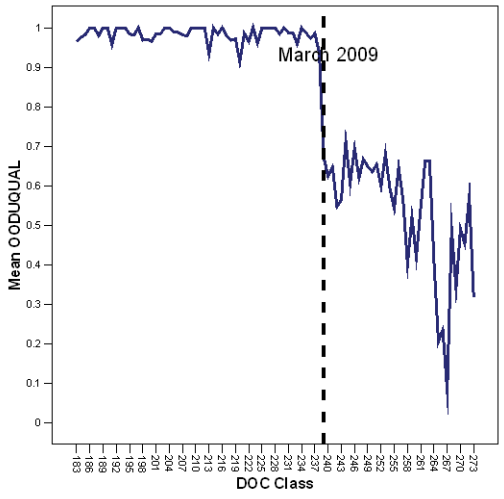
Descriptive Analysis

Convening Class Dates

As mentioned earlier, Surface Navy removed the requirement of having officers complete their OOD/U PQS in March of 2006. As shown in Figure 1, instantly the proportion of officers with this critical PQS fell to between 60% to 70%, and over time has continued to fall until less than one in two officers attending ASAT do not have their OOD/U qualification. As will be covered in detail below, having this qualification is one of the most important factors explaining how well ASAT attendees score on all exams. Thus, we believe it is important to focus on the period when there is a diversity of basic fundamental knowledge and as such all empirical analysis will begin with Class 239, which enrolled in ASAT during March 2009.

FIGURE 1.

Percent OOD/U Qualified: 2003:3 - 2011:2

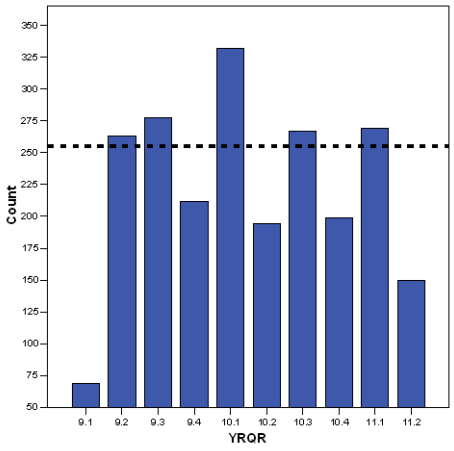


As seen in Figure 2, roughly 250 officers have enrolled in ASAT each quarter over the 30 month period, with larger enrollments during the first and third calendar quarters. This pattern reflects the fact that most officers spend between 12 to 16 months before coming to ASAT and

most graduate from college in the second and fourth calendar quarters. It may be noted that class size remains relatively constant as more class sections are added during quarters when enrollment is higher.

FIGURE 2.

ASAT Class Size: 2009:1 - 2011:2



The sample size for ASAT enrollees differs by the length of time each exam was offered. As shown in Table 2, three exams - Fundamentals, Rules-of-Road, and Maritime Warfare – are recorded for the early classes beginning in March 2009 (Class 239), but only the first two were constantly administered through the last available class (273) offered in June 2011 and have the largest sample sizes (2,223). The Maritime Warfare exam was eliminated in November 2010 along with the Navigation exam. The latest exam administered at ASAT is a Final Exam having the fewest (486) observations.

TABLE 2.

Number of Observations for ASAT Test Score Models

ASAT Test	Number of Cases	Class Dates		Class Number	
		Start	End	Start	End
Surface Warfare Fundamentals	2,223	9-Mar-09	6-Jun-11	239	273
Maritime Warfare	1,735	9-Mar-09	1-Nov-10	239	264
Rules-of-Road	2,222	9-Mar-09	6-Jun-11	239	273
Navigation	914	4-Jan-10	1-Nov-10	251	264
Final Exam	486	29-Nov-10	6-Jun-11	265	273

The average length of time between commissioning and attendance at ASAT is 21 months and as shown in Figure 3, those obtaining their OOD/U do so on average one month prior to ASAT.

FIGURE 3.

Distribution of Months to OODU Before ASAT

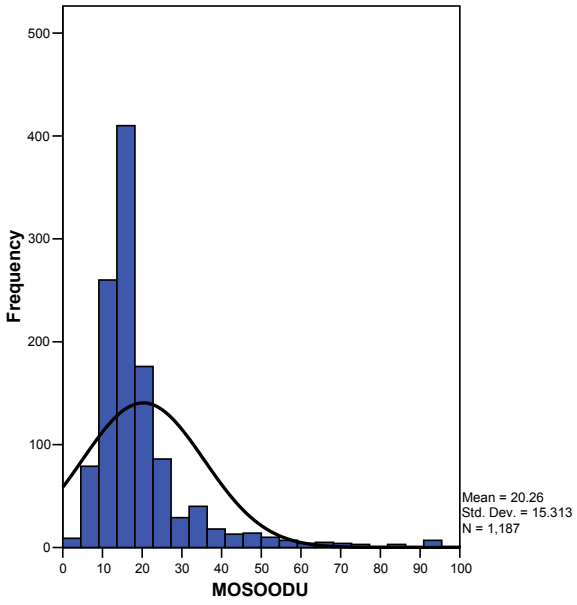
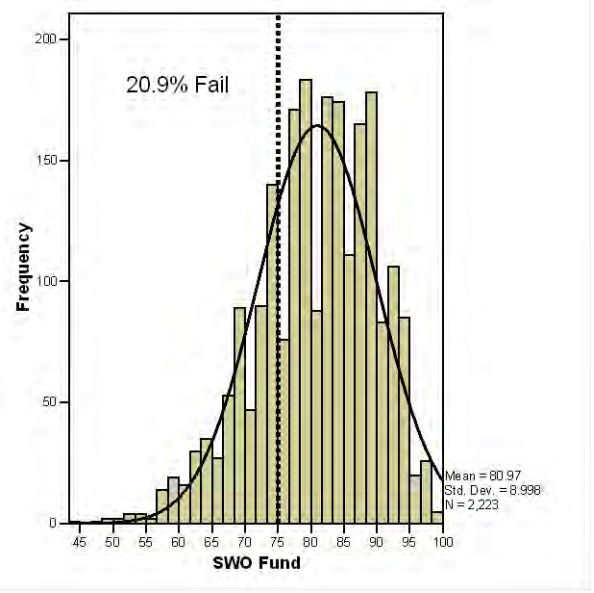
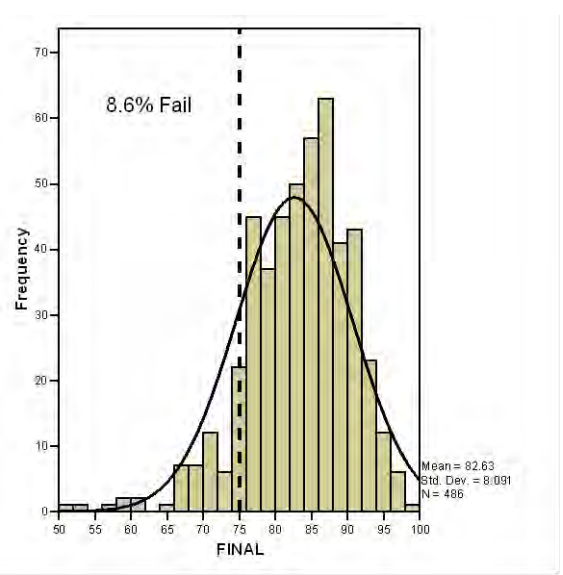
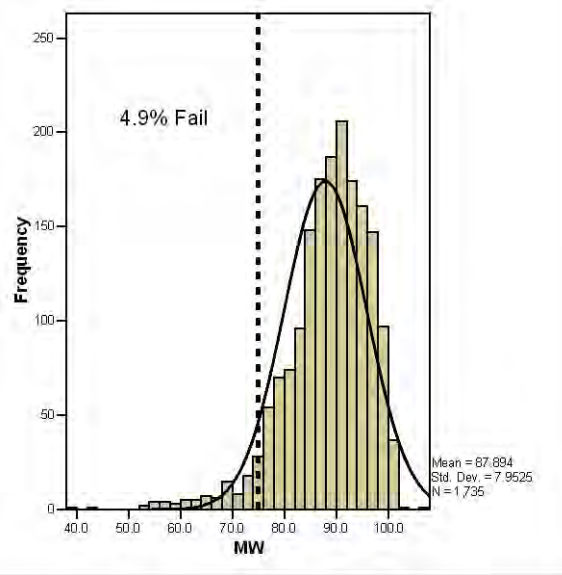


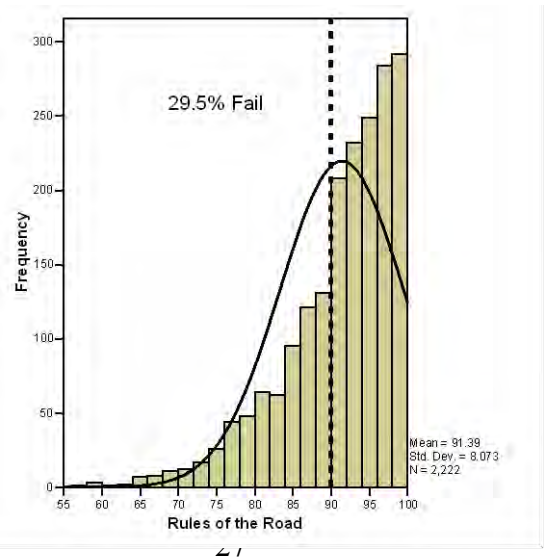
FIGURE 4.

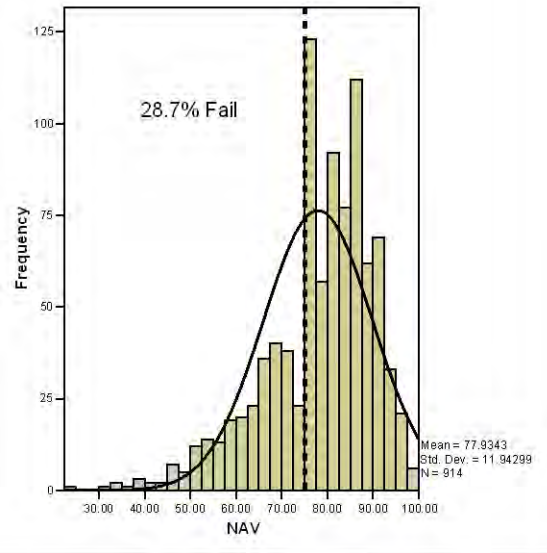
Distribution of ASAT Test Scores & Failure Rate











Specification of ASAT Performance Models

A major objective of the quantitative portion of this report is the specification of multiple regression models of junior surface warfare officer performance at the ASAT leveling schoolhouse training program. First, we will describe the measures of performance on ASAT exams, followed by a discussion of how the various explanatory factors are grouped and scaled when used later in the regressions. Care is taken to explain the theory and justification of why the explanatory variables are included along with how each factor is expected to affect ASAT performance.

ASAT Exam Performance

The distribution of test scores of the five ASAT exams are depicted above in Figure 4, along with assigned pass/fail rates. With the exception of Rules-of-Road exam, the passing grade of 75% results in 20% to 30% of test takers failing on their first attempt. Generally, officers are given one follow-up exam to pass, and the vast majority of retakes reach a passing grade.[1] Material covered in the Roles-of-Road exam are so critical to basic knowledge of a surface warfare officer that a higher passing rate of 90% is assigned, resulting in a fail rate of 30% on the first time the test is administered during the ASAT course.

The procedure followed in the report will present two levels of data analysis. In this section, purely descriptive analysis will be undertaken with two objectives in mind. First, tabular analysis will be presented to define clearly what factors are available to explain ASAT performance and how they are measured and scaled for the more complex regression models to follow. Second, actual differences in ASAT performance across the various factors are presented in this section so that the reader understands the two-way relationships one observes in the surface navy. It is important to emphasize that this part of the report purposively presents simple bivariate relationships and ignores other more complex relationships existing among a multitude of factors related to the early classroom training experiences of junior surface warfare officers. In the next section, we build more complex multiple regression models that are designed to estimate the independent impact of each explanatory factor described below on ASAT performance.

Differences between the simple two-way observed outcomes and the more complex multivariate modeling outcomes will be noted where appropriate. The purpose of building more complex econometric models is to explain deviations from the mean exam scores as well as the probability to fail an exam on the first attempt. Particular emphasis is placed on the latter as

[1] A letter is sent to the Commanding Officer of the officer's ship for those who never pass an ASAT exam even after retakes are given. It is expected that these officers are examined more closely than otherwise on the material covered by the exam by the ship's personnel in charge of training aboard ship.

most deviations from the mean are relatively small and don‘t appear to be very meaningful to decision-makers. Rather, what is important is whether or not individuals acquire sufficient level of understanding to pass an exam at the designated level. Failure to do so reflects such a lack of basic understanding that an individual must know that he or she must go back and learn the material if he or she is to be held accountable for a minimum level of understanding whether it be Rules-of-Road, SWO fundamentals, maritime warfare, or navigation.

The research methodology followed throughout this quantitative portion of the report relates three groups of explanatory variables to explain ASAT performance. Besides observed navy experience factors, we also include two important types of variables that are external to Surface Navy – demographic characteristics and college experience prior to commissioning.

Explanatory Factors

1. *Demographics***.** First an individual's age, gender, race, and marital status are included as basic explanatory factors that are expected to be related to performance on ASAT exams. Roughly one-half of newly commissioned officers age 22-23 are commissioned directly out of college and are identified as the control group in later regressions. Some, however, are older that may indicate having worked first in the private sector (i.e., OCS graduates who first look for and some who find employment in the civilian labor market) and others who enlisted directly out of high school in the navy and either later choose to become a

TABLE 3.

Age & ASAT Performance

ASAT TEST	MEAN SCORE BY AGE GROUP: (N = 2,223)				
	20-21	22-23*	24-29	30+	TOTAL
SWO Fundamentals	83.0	81.2	80.2	80.0	81.0
Maritime Warfare	90.4	88.3	87.7	85.3	87.9
Rules-of-Road	93.1	91.8	90.9	89.4	91.4
Navigation	79.6	80.0	77.4	67.1	77.9
Final Exam	84.9	83.3	80.9	80.2	82.6
% DISTRIBUTION	10.8%	49.0%	27.1%	13.0%	100.0%

ASAT TEST	PERCENT FAIL BY AGE GROUP: (N = 2,223)				
	20-21	22-23*	24-29	30+	TOTAL
SWO Fundamentals	18.3%	20.3%	22.8%	21.4%	20.9%
Maritime Warfare	3.2%	4.1%	3.7%	10.4%	4.9%
Rules-of-Road	21.3%	28.1%	32.7%	35.2%	29.5%
Navigation	26.3%	20.6%	31.5%	63.7%	28.7%
Final Exam	3.6%	6.8%	10.9%	27.3%	8.6%
% DISTRIBUTION	10.8%	49.0%	27.1%	13.0%	100.0%

commissioned officer (~~"~~mustangs") or are Limited Duty Officers (LDOs) or Chief Warrant Officers (CWOs) who are chosen to be a Division Officer in the surface navy. These individuals generally have additional ‗firm and industry specific human capital' compared to those commissioned immediately following college graduation, and may therefore be expected to attain higher average scores and be less likely to fail an ASAT exam.

As shown in Table 4, age appears to be inversely related to performance at ASAT, with older officers realizing lower average scores and experience higher failure rates on exams. These results are counter intuitive to the human capital theory expressed above. One possible explanation is that older individuals in the data set are mainly non-commissioned officers who enlisted in the navy directly out of high school whereas younger individuals are commissioned officers having recently graduated from college. Academic ability differences between the two groups could then explain this inverse relationship.

A second demographic variable, ethnicity, is commonly included as explanatory variables in models of classroom performance. It is not uncommon to find minorities scoring below that of the white majority owing to a host of factors including differential family expectations of the value of education and differences in school resources and overall quality of early schooling. In Table 4 below we note lower scores and higher exam failure rates of minorities, especially those of African-Americans.

Similarly, gender is typically included as another demographic variable specified in classroom performance. Female college students generally attain the same or higher test scores and therefore should be expected to achieve similar test results in ASAT to that of males. One possible exception, however, is that the navy culture and environment has traditionally been male oriented and as such females may either explicitly or implicitly may be excluded from assistance and guidance onboard ship in the day-to-day learning by doing atmosphere. We note in Table 5 below, female average test scores and failure rates mirror that of males in all exams except for SWO Fundamentals, and the failure rates on this exam of females is far above that of males (29% versus 18.5%). These findings lend support to the notion that the learning environment aboard ships may be more conducive to males as once

TABLE 4.

Ethnicity & ASAT Performance

ASAT TEST	MEAN SCORE BY ETHNICITY: (N = 2,223)					
	White	Black	Hispanic	Asian	Other	Total
SWO Fundamentals	82.1	74.7	77.2	81.5	80.2	81.0
Maritime Warfare	88.5	85.5	85.4	87.4	87.7	87.9
Rules-of-Road	92.0	87.5	90.0	91.2	91.2	91.4
Navigation	79.0	70.8	75.4	77.2	78.0	77.9
Final Exam	83.4	77.2	79.5	83.6	85.0	82.6
% DISTRIBUTION	75.0%	9.4%	6.0%	6.2%	3.4%	100.0%

ASAT TEST	PERCENT FAIL BY AGE GROUP: (N = 2,223)					
	White	Black	Hispanic	Asian	Other	Total
SWO Fundamentals	16.7%	45.5%	32.1%	20.6%	26.3%	20.9%
Maritime Warfare	3.8%	10.5%	7.5%	8.4%	2.9%	4.9%
Rules-of-Road	26.8%	46.4%	37.3%	30.1%	28.9%	29.5%
Navigation	24.6%	55.1%	40.0%	36.5%	21.6%	28.7%
Final Exam	5.6%	21.3%	25.0%	10.3%	14.3%	8.6%
% DISTRIBUTION	75.0%	9.4%	6.0%	6.2%	3.4%	100.0%

TABLE 5.

Gender, Marital Status & ASAT Performance

ASAT TEST	MEAN SCORE BY GENDER:			MEAN SCORE BY MARITAL STATUS:		
	Male	Female	Total	Not Married	Married	Total
SWO Fundamentals	81.5	79.2	81.0	81.0	81.0	81.0
Maritime Warfare	87.8	88.1	87.9	88.0	87.6	87.9
Rules-of-Road	91.4	91.4	91.4	91.5	91.1	91.4
Navigation	78.4	76.3	77.9	78.7	76.1	77.9
Final Exam	82.4	83.2	82.6	83.0	81.8	82.6
% DISTRIBUTION	76.9%	23.1%	100.0%	67.2%	32.8%	100.0%

ASAT TEST	PERCENT FAIL BY GENDER:			PERCENT FAIL BY MARITAL STATUS:		
	Male	Female	Total	Not Married	Married	Total
SWO Fundamentals	18.5%	29.0%	20.9%	21.4%	19.9%	20.9%
Maritime Warfare	4.9%	5.0%	4.9%	4.8%	5.1%	4.9%
Rules-of-Road	29.7%	28.9%	29.5%	29.5%	29.6%	29.5%
Navigation	28.3%	30.0%	28.7%	26.1%	34.5%	28.7%
Final Exam	8.9%	7.8%	8.6%	6.6%	13.7%	8.6%
% DISTRIBUTION	76.9%	23.1%	100.0%	67.2%	32.8%	100.0%

female junior officers enter typical schoolhouse settings they seem to perform on par or above that of male officers.

Lastly, marital status (at the time of ASAT) is included as prior research (Bowman and Mehay (2000) has found support for the view that individuals choosing to get married are more motivated to perform due to the additional family responsibilities compared to those choosing to remain single (or divorced) and as such are more productive in the workplace. We see in Table 5 above little differences in test scores across the two marital status groups, but higher failure rates on the Navigation and Final exams. There is no meaningful justification for these latter differences, and may in fact reflect the possibility that other intervening factors correlated with marital status and ASAT performance may first have to be accounted for before one can obtain more meaningful relationships of marital status and schoolhouse performance.

2. *College Experience*. The second major group of explanatory variables specified in ASAT performance models include three aspects of college experience – including the level of military training acquired prior to commissioning, the quality of college attended, and one's academic major.

First, military training prior to commissioning is measured by commissioning source – those attending the Naval Academy are assumed to acquire the most prior military training as they live in a strict military environment 24-7 over four years including summer training programs, and are required to take additional professional development classes each semester enrolled. Next are NROTC graduates who take additional military specific classes, are required to take a summer training cruise prior to graduation, and are an active part of a ROTC unit on or near campus. Next come OCS graduates who, following graduation, attend OCS School at Newport for six months. While most surface warfare division officers are non-prior service commissioned officers, a relatively small proportion are comprised of prior service enlisted personnel who are chosen to attend one of the major three commissioning programs along with a small percentage of LDOs and CWOs chosen to become division officers but remain in the enlisted force. Some individuals with observed prior enlisted service are commissioned officers (e.g. Seaman to Admiral –mustangs") and are classified as Enlisted Commissioning Programs (ECP), although others with prior service who graduate from the three major commissioning programs may not be accurately identified and as such measurement errors may be introduced into the data with the ECP specification.

In general, those commissioned following college graduation having greater exposure to military training would be expected to outperform others at ASAT. Accordingly, one would expect better performance at ASAT by Academy graduates followed by NROTC then OCS. Individuals with prior-service (ECP) should also do better than non-prior service graduates. Expectations of ASAT performance of non-commissioned officers relative to the control group of Academy graduates is somewhat ambiguous as their years of active duty navy experience (and some have acquired a college degree while on active duty) should result in higher performance on tests, but these individuals are also ones who chose to enlist directly out of high school rather than attending college and may not perform as well in classroom settings.

The observed differences in test scores and failure rates by commissioning program are shown above where results of Naval Academy graduates are highlighted. We notice marginal differences in test scores favoring expectations relative to levels of military training, and somewhat larger differences in failure rates on the navigation (18% versus 26% and 32%) and final (4% versus 9% and11%) exams across the three major commissioning programs. Similarly, prior-service graduates of these (ECP) programs have slightly higher test scores and lower failure rates on the first three exams (SWO Fundamentals, Maritime Warfare, and Rules-of-Road) but not on the Navigation or Final exams. The observed outcomes for non-commissioned officers differs drastically from Academy graduates as they have lower scores and higher fail rates at ASAT, especially on the Navigation exam (roughly 70% fail compared to

TABLE 6.

Commissioning Source & ASAT Performance

ASAT TEST	MEAN SCORE BY COMMISSIONING PROGRAM:						
	Naval Acad	NROTC	OCS	ECPs	LDO	CWO	TOTAL
SWO Fundamentals	81.7	81.2	80.0	83.1	79.9	80.0	81.0
Maritime Warfare	88.4	88.2	88.1	88.8	85.8	83.4	87.9
Rules-of-Road	91.9	92.1	90.8	93.5	89.3	87.6	91.4
Navigation	80.8	78.9	77.0	79.1	65.3	65.3	77.9
Final Exam	83.8	83.0	81.3	83.3	NA	88.8	82.6
% DISTRIBUTION	29.4%	27.0%	29.0%	5.0%	6.1%	3.4%	100.0%

ASAT TEST	PERCENT FAIL BY COMMISSIONING PROGRAM:						
	Naval Acad	NROTC	OCS	ECPs	LDO	CWO	TOTAL
SWO Fundamentals	19.3%	21.3%	23.8%	11.7%	20.6%	21.3%	20.9%
Maritime Warfare	4.1%	4.5%	4.0%	1.0%	10.3%	14.3%	4.9%
Rules-of-Road	28.4%	26.3%	32.8%	18.2%	36.8%	40.0%	29.5%
Navigation	17.9%	26.1%	31.8%	32.4%	70.7%	68.0%	28.7%
Final Exam	4.3%	9.4%	11.3%	9.1%	NA	0.0%	8.6%
% DISTRIBUTION	29.4%	27.0%	29.0%	5.0%	6.1%	3.4%	100.0%

18%). These findings suggest that individuals who forego college directly out of high school fare less well in the classroom training even after having many years of experience aboard ships.

The second form of college experience measured in regression models measures the academic quality of the undergraduate institution (i.e., Barrons Index of Colleges). It is assumed that colleges which are more selective attract and graduate individuals who may have greater cognitive ability and/or motivated to learn and as such should score better on ASAT exams and be less likely to fail an exam. The list of colleges listed by the Barrons Index is given below in Table 7. Earlier attempts in specifying this variable resulted in significant differences only at the tail ends of the seven stratifications thus the quality index reported in this report is collapsed into three categories – most competitive, competitive (the control group), and less/non-competitive. Schools of junior officers from the top category include most Ivy League colleges and highly

selective liberal arts colleges such as Notre Dame, William and Mary, Carleton College, and Amherst. It is interesting to note that most of these schools are not known for their technical majors (especially engineering) which is so highly regarded by many senior leaders in the navy. At the other end of the spectrum are the less competitive schools which include: smaller public state universities - such as San Francisco State, Cleveland State, and Kansas State Universities - and smaller private schools such as Grambling, St. Leo College, Luther College, and Spellman College. Nearly 90% of officers in the control group graduate from schools having moderate levels of selection and are mainly comprised of large well-known state universities such as: the Universities of Texas, North Carolina, Maryland, Missouri and San Diego State University.

Observed ASAT outcomes related to college quality are shown below in Table 8. Relative to the control group of graduates from moderately competitive colleges, we see that graduates from the most (least) competitive schools have somewhat higher (lower) scores and are far less(more) likely to fail ASAT exams. These findings come at no surprise as it supports the notion that colleges with more selective standards graduate individuals who later will outperform others in similar classroom settings.

TABLE 7.

Barrons Index of College Quality

MOST COMPETITIVE:

COLLEGE	COUNT	COLLEGE	COUNT	COLLEGE	COUNT	COLLEGE	COUNT
Notre Dame, Univ of	50	Carnegie Mellon Univ	19	Rice Univ	7	Princeton	2
Virginia, University of	43	Georgetown Univ	19	New York State Univ	4	Amherst College	1
Holy Cross, College of the	40	California at Berkeley, Univ of	18	Tufts Univ	4	California Institute of Technology	1
Cornell Univ	36	Duke Univ	18	Yale Univ	4	California, Univ of	1
Northwestern	29	M I T	13	Stanford	3	Carleton College	1
California at Los Angeles, Univ of	25	Harvard	12	William & Mary College	3	Colby College	1
Pennsylvania, Univ of	25	Columbia Univ	7	Emory University	2	Davidson College	1

HIGHLY COMPETITIVE, VERY COMPETITVE, COMPETITIVE:

COLLEGE	COUNT	COLLEGE	COUNT	COLLEGE	COUNT	COLLEGE	COUNT
Old Dominion Univ	137	Ohio State Univ	41	Embry-Riddle Aeronautical Univ	29	Drexel Univ	17
San Diego, Univ of	86	Boston University	40	Marquette Univ	29	Rochester Institute of Technology	17
Virginia Tech	82	Vanderbilt Univ	39	South Florida, Univ of	29	Florida A & M Univ	16
Penn State	77	Virginia Military Institute	39	Florida State Univ	26	Fordham Univ	14
Texas A & M	73	Idaho, Univ	38	Pittsburgh, Univ of	25	SUNY Brockport	14
Washington, Univ of	71	Maryland, Univ of	38	Morehouse College	23	Boston College	13
North Carolina State Univ	65	North Florida, Univ of	38	North Carolina Univ at Chapel Hill	23	California at San Diego, Univ of	13
Arizona, Univ of	62	Southern California, Univ of	38	Minnesota Univ	22	Illinois Institute of Technology	13
Jacksonville Univ	62	Excelsior College	36	Hawaii Pacific University	21	Merchant Marine Academy	13
The Citadel	60	Southern Illinois Univ	36	New Mexico, Univ of	21	Memphis Univ	12
Colorado, Univ of	55	Illinois, Univ of	35	Texas, Univ of	21	U S Coast Guard Academy	12
Purdue Univ	53	Michigan, Univ of	35	Oklahoma Univ	20	Worcester Polytechnic Institute	12
Villanova	53	South Carolina, Univ of	35	Wisconsin-Madison Univ	20	Houston, Univ of	11
Auburn Univ	51	San Diego State Univ	34	Mississippi, Univ of	19	National Univ	11
Oregon State	47	Missouri, Univ of	32	Nebraska Univ	19	New School Univ	11
Rensselaer Polytechnic Institute	47	Miami Univ	31	Phoenix, Univ of	19	U S Merchant Marine Academy	11
Tulane Univ	47	Georgia Institute of Technology	30	Utah Univ	19	Eastern Michigan	10
George Washington Univ	45	Iowa State	30	Maine Maritime Academy	18	Louisiana State Univ	10
Florida, Univ of	43	Norfolk State Univ	30	Texas at Austin, Univ of	18	Maine Univ	9
Thomas Edison St Univ	43	Rochester, Univ of	30	USNA	18	Miami of Ohio	9

LEAST & NON-COMPETITIVE:

COLLEGE	COUNT	COLLEGE	COUNT	COLLEGE	COUNT	COLLEGE	COUNT
Norwich Univ	32	American Intercontinental Univ	2	Berry College	1	Inter American Univ	1
Prairie View A & M Univ	25	California State Univ, at Sacramer	2	Bluefield State College	1	Johnson & Wales University	1
Kansas, Univ of	23	Central Missouri St Univ	2	Briar Cliff Univ	1	Kansas State Univ	1
St. Leo College	19	Devery College	2	California at Bakersfield, Univ of	1	Kent State	1
Savannah State Univ	14	Devry University	2	California State Univ, at San Marcos	1	Langston Univ	1
Hampton University	12	Eastern Washington Univ	2	Clark Atlanta University	1	Limestone College	1
SUNY Maritime College	9	Grambling State Univ	2	Cleveland State Univ	1	Lipscpomb University	1
Wayland Baptist Univ	9	Marshall Univ	2	Columbus Univ	1	Livingstone College	1
Southern Univ	8	National Louis Univ	2	Crichton College	1	Louisville, Univ of	1
Georgia State Univ	7	Saint Leo University	2	Delaware State University	1	Lubbock Christian University	1
California Maritime Academy	6	San Francisco St Univ	2	Devry Univ	1	LUTHER COLLEGE	1
Park University	6	Texas at El Paso, Univ of	2	DeVry University	1	Mary Baldwin College	1
Hampton Roads	5	Texas at San Antonio, Univ of	2	Edwards University	1	Minot State University	1
Hawaii, Univ of	5	Univ of Louisiana at Monroe	2	Endicott College	1	Missouri Southern State College	1
New York Maritime College	4	Univ of PA, Edinboro	2	Ferris State University	1	Missouri State	1
Spelman College	4	Univ of Southern Indiana	2	Fort Hays State College	1	Northwestern State University	1
Clark Atlanta Univ	3	Alabama State Univ	1	Fort Valley State College	1	Oakland Univ	1
Liberty Univ	3	Alabama, Univ of North	1	Georgian Court Univ	1	Ottawa Univ	1
Montana State Univ	3	Alaska, Univ	1	Grantham Univ	1	Polytechnic Univ of Philippines	1
Akron, Univ of	2	Bay Path College	1	Indiana Wesleyan Univ	1	Robert Morris Univ	1

TABLE 8.

College Quality & ASAT Performance

ASAT TEST	MEAN SCORE BY COMMISSIONING PROGRAM:			
	MOST COMPETITIVE	COMPETITIVE	LESS/NON-COMPETITIVE	TOTAL
SWO Fundamentals	84.8	81.2	76.2	81.0
Maritime Warfare	91.8	87.8	86.5	87.9
Rules-of-Road	94.7	91.4	89.5	91.4
Navigation	81.2	78.0	74.3	77.9
Final Exam	85.3	83.1	77.3	82.6
% DISTRIBUTION	4.5%	88.5%	7.0%	100.0%

ASAT TEST	PERCENT FAIL BY COMMISSIONING PROGRAM:			
	MOST COMPETITIVE	COMPETITIVE	LESS/NON-COMPETITIVE	TOTAL
SWO Fundamentals	11.9%	20.0%	38.1%	20.9%
Maritime Warfare	2.5%	5.0%	5.7%	4.9%
Rules-of-Road	14.9%	29.8%	35.5%	29.5%
Navigation	19.0%	28.1%	43.1%	28.7%
Final Exam	9.5%	7.2%	20.4%	8.6%
% DISTRIBUTION	4.5%	88.5%	7.0%	100.0%

The third aspect of college experience factor is one‘s undergraduate major, comprised of three technical majors (engineering/architecture, math/physical sciences, and biological sciences) and three non-technical majors (social sciences, humanities, and others including physical education, education, etc.). The navy prides itself on technical skills and as such one would expect those with technical majors to do better on exams designed by Surface Navy, most notably on the more technically oriented exams such as Rules-of-Road, Navigation, and Engineering.

TABLE 9.

Undergraduate Major & ASAT Performance

ASAT TEST	MEAN SCORE BY UNDERGRADUATE MAJOR:							
	Engineering	Math & Physical Sciences	Biological Sciences	Business & Economics	Social Sciences	Humanities	Educantion-PE-Other	TOTAL
SWO Fundamentals	83.4	82.3	81.1	79.9	80.0	80.4	79.5	81.0
Maritime Warfare	89.6	88.7	89.1	87.1	87.9	87.5	84.8	87.9
Rules-of-Road	93.1	91.7	93.0	91.8	90.6	91.8	88.5	91.4
Navigation	81.8	78.9	77.9	78.6	76.3	80.4	69.0	77.9
Final Exam	85.0	83.6	82.9	81.9	82.2	80.3	79.6	82.6
%DISTRIBUTION	17.8%	14.1%	6.5%	14.0%	30.0%	7.3%	10.2%	100.0%

ASAT TEST	PERCENT FAIL BY UNDERGRADUATE MAJOR:							
	Engineering	Math & Physical Sciences	Biological Sciences	Business & Economics	Social Sciences	Humanities	Educantion-PE-Other	TOTAL
SWO Fundamentals	14.2%	18.5%	19.9%	24.4%	23.5%	23.5%	22.6%	20.9%
Maritime Warfare	1.9%	3.8%	2.3%	4.6%	4.1%	8.0%	12.6%	4.9%
Rules-of-Road	23.4%	29.6%	20.5%	26.9%	32.7%	30.2%	39.4%	29.5%
Navigation	15.1%	23.8%	34.4%	26.2%	33.7%	25.4%	55.4%	28.7%
Final Exam	4.8%	8.9%	6.3%	12.0%	8.5%	8.1%	15.0%	8.6%
%DISTRIBUTION	17.8%	14.1%	6.5%	14.0%	30.0%	7.3%	10.2%	100.0%

The largest percentage of commissioned officers are social science majors in college (30%) and these individuals are selected as the control group for this college experience variable. As seen in Table 9 below, of all technical majors, engineering majors are observed to achieve the highest ASAT scores and have the lowest fail rates, while the other technical majors outperform social science majors but not to the extent of engineers. ASAT performance of humanities majors is similar to that of social science majors although business/economics majors have slightly higher scores and lower failure rates on the Rules-of-Road and Navigation exams. Education, PE and other majors generally score lower and have higher fail rates on all ASAT exams with the exception of SWO Fundamentals than the control group. In general, these observed outcomes are what one might normally expect for classroom performance.[2]

3. *Navy Assignments.* The third major group of explanatory variables specified in regression models measure varying types of Surface Navy assignment polices, including: duty station, ship type, and Division Officer (DIVO) assignment by the ship's command.

Discussion with ships' crews during interviews collected in the qualitative portion of the project continually emphasized the role underway time plays in obtaining one's OOD/U and time to becoming warfare qualified. In addition, we were informed that certain duty stations such

[2] A recent study by the National Survey of Student Engagement (2011) reports that engineering majors study more than any other major – 19 hours per week while social science majors study the least (14 hours). It is possible that technical majors may have greater cognitive ability and motivation, while facing greater challenges than others.

as Japan have significantly greater underway time due to their joint operations with foreign navies. As such, differences in ASAT test scores are expected to vary across both ship types and duty stations due to varying underway time and scheduled repairs.

Surface Navy ship and homeport assignments, however, are also affected by policies that reward academic and military performance in college, most notably for over half of all newly commissioned surface warfare officers from the Naval Academy (29%) and from NROTC graduates of civilian colleges (27%). The ~~-~~rack-and-stack" ranking system allows those with better grades to have first choice of ship types and duty stations. Favored ship types (e.g. major combatants, especially guided missile destroyers (DDGs with 40% of all JOs)) and duty station locations (e.g. Pearl Harbor and Japan) are typically the first choice among those standing at the top of their college class, leaving those closer to the bottom of the scholarship programs having to select less desired ships (often amphibious ships) and all ship types based in Norfolk (accounting for over one-third of all JOs).

ASAT outcomes by duty station and ship type are shown below in Table 10 where destroyers and Norfolk are the relevant control groups specified later in regressions. As expected, ASAT exam scores tend to be higher (lower) and failure rates lower (higher) in most duty stations (ship types) compared to Norfolk (DDGs).These results support the view that these two forms of Surface Navy selection may well act as a proxy for academic and military performance during college years. Individuals selecting Norfolk as their duty station generally have lower ASAT test scores and higher failure rates than other homeport assignments. Other test results differ among the various duty stations, but no single homeport appears to distinguish itself from the others regarding ASAT performance.

The third assignment policy is that of the Division Officer Department aboard a ship. Since all junior officers are required to pass necessary PQS qualifications as part of their early training program before warfare qualification, one might not expect department assignment to be meaningfully related to performance on ASAT exams. Two exceptions to this view, however, were uncovered during the qualitative interviews. First, some Chief Petty Officer (CPO) billets remain gapped when newly commissioned officers are assigned to a particular division resulting in additional job responsibilities of the young Division Officer (DIVO). With the DIVOs time being

TABLE 10.

Duty Station, ShipType & ASAT Performance

(A) Duty Station

ASAT TEST	MEAN SCORE BY DUTY STATION:						
	Washington	San Diego	Pearl Harbor	Japan-Guam	Norfolk	FL-TX-MI	TOTAL
SWO Fundamentals	82.3	81.4	81.9	81.3	79.6	82.4	81.0
Maritime Warfare	89.9	88.5	88.5	88.0	86.8	88.3	87.9
Rules-of-Road	92.6	91.5	92.6	91.7	90.3	92.6	91.4
Navigation	78.1	78.5	82.1	76.8	76.4	79.4	77.9
Final Exam	84.1	83.5	84.3	80.8	82.3	81.6	82.6
% DISTRIBUTION	3.5%	30.0%	6.9%	11.6%	35.2%	12.8%	100.0%

ASAT TEST	PERCENT FAIL BY DUTY STATION:						
	Washington	San Diego	Pearl Harbor	Japan-Guam	Norfolk	FL-TX-MI	TOTAL
SWO Fundamentals	16.7%	19.8%	16.8%	21.8%	24.9%	15.1%	20.9%
Maritime Warfare	0.0%	4.6%	3.5%	4.2%	6.6%	3.7%	4.9%
Rules-of-Road	21.8%	28.1%	19.5%	29.2%	34.9%	26.0%	29.5%
Navigation	29.4%	26.1%	17.2%	31.7%	33.7%	24.6%	28.7%
Final Exam	6.7%	8.1%	7.1%	10.8%	9.1%	7.1%	8.6%
% DISTRIBUTION	3.5%	30.0%	6.9%	11.6%	35.2%	12.8%	100.0%

(B) Ship Type

ASAT TEST	MEAN SCORE BY SHIP TYPE:					
	Frigates	Destroyers	Cruisers	Amphibs	Other	TOTAL
SWO Fundamentals	81.0	82.2	81.2	78.8	80.3	81.0
Maritime Warfare	87.4	89.5	88.4	86.0	85.1	87.9
Rules-of-Road	91.5	91.7	91.4	90.7	91.5	91.4
Navigation	79.2	79.5	73.6	78.3	71.5	77.9
Final Exam	82.0	83.2	82.9	82.3	79.4	82.6
% DISTRIBUTION	14.4%	41.1%	14.9%	23.2%	6.4%	100.0%

ASAT TEST	PERCENT FAIL BY SHIP TYPE:					
	Frigates	Destroyers	Cruisers	Amphibs	Other	TOTAL
SWO Fundamentals	19.1%	16.4%	18.2%	30.3%	25.7%	20.9%
Maritime Warfare	4.1%	3.1%	1.9%	8.8%	9.9%	4.9%
Rules-of-Road	28.2%	28.7%	29.0%	32.8%	27.1%	29.5%
Navigation	22.7%	24.5%	40.7%	27.6%	52.9%	28.7%
Final Exam	5.7%	8.7%	8.3%	7.3%	21.7%	8.6%
% DISTRIBUTION	14.4%	41.1%	14.9%	23.2%	6.4%	100.0%

directed more to their job as a division leader, they have less time to devote to getting all PQS qualifications and less time to study in preparation for ASAT. Since this information is lacking in the data, it is not possible to quantify this important factor in all regressions. However, another facet was specified in the data and that is the department assignment called "Other" (encompassing various Executive and Administrative job titles). This department is assigned to those newly reporting junior officers not given a specific major department such as Weapons, Combat Systems, Engineering and the like. In essence, these junior officers are not under the major guidance of a specific Department Head or CPO. While one would surmise that these officers have additional time to obtain their PQS qualifications and have more time to prepare for ASAT exams – and thus do better at ASAT – we also uncovered a countervailing force affecting one's motivation to learn. In particular, junior officers not assigned to a major department felt relatively useless and uncared for. They simply seemed far less motivated as they felt among "the forgotten." This was especially noticeable among Frigates (FFGs), which are to be decommissioned in the near future and have large numbers of unassigned junior officers. While we did uncover instances of "cross-decking" that could offset this de-motivational aspect, we believe that cross-decking was relatively atypical and far from the norm. As such, it is difficult to ascertain whether or not department assignment has a net positive or negative influence on ASAT exams.

Those assigned to the Weapons Department (17% of the total) will act as the control group in regression specifications. As indicated in Table 11 below, ASAT test scores and exam fail rates, in general, suggests that there are no large differentials in ASAT performance across shipboard department assignments– with the exception of those assigned to jobs classified as "other." As explained earlier, these "unassigned" officers don't have full division officer responsibilities and while one would expect them to have more time to prepare for ASAT, may in fact have less guidance and support than other junior officers with major DIVO responsibilities. In addition, they may be less motivated to learn if they do not feel they are a contributing and valuable Wardroom asset.

TABLE 11.

Department Assignment and ASAT Performance

ASAT TEST	MEAN SCORE BY DEPARTMENT ASSIGNMENT:						
	Combat Systems	Operations	Weapons	Engineering	Navigation	Other	TOTAL
SWO Fundamentals	82.0	81.3	82.0	80.2	82.4	78.2	81.0
Maritime Warfare	87.9	88.5	90.6	86.8	89.8	85.0	87.9
Rules-of-Road	91.8	91.2	92.3	91.5	92.5	89.3	91.4
Navigation	79.2	77.8	78.5	77.3	82.7	76.7	77.9
Final Exam	82.6	83.2	83.1	82.9	79.8	78.9	82.6
% DISTRIBUTION	18.2%	25.8%	17.4%	28.2%	0.6%	9.8%	100.0%

ASAT TEST	PERCENT FAIL BY DEPARTMENT ASSIGNMENT:						
	Combat Systems	Operations	Weapons	Engineering	Navigation	Other	TOTAL
SWO Fundamentals	15.1%	18.5%	17.3%	24.7%	7.7%	34.4%	20.9%
Maritime Warfare	3.7%	3.3%	0.7%	7.6%	0.0%	10.5%	4.9%
Rules-of-Road	26.0%	32.0%	25.6%	29.3%	30.8%	37.2%	29.5%
Navigation	23.6%	31.3%	25.6%	30.2%	33.3%	31.6%	28.7%
Final Exam	11.1%	7.3%	8.1%	7.7%	25.0%	10.8%	8.6%
% DISTRIBUTION	18.2%	25.8%	17.4%	28.2%	0.6%	9.8%	100.0%

Empirical Results of Modeling ASAT Performance

Multiple Regression Methodology of Study

The influence of the three major groups of variables discussed above on performance in the ASAT schoolhouse portion of junior surface warfare officer training is depicted below in Figure 5. As mentioned earlier, knowledge acquired by one's completing the OOD/U qualification is crucial to one's performance during ASAT. This is depicted in the figure by the dashed lines relating the three major groups of explanatory variables directly affecting the acquisition of OOD/U. Individuals who are depicted as having greater stocks of human capital (i.e., have attended better schools and colleges, who have greater cognitive ability) and who are attached to favored duty stations and ship types are more likely to obtain their OOD/U qualification. This in turn has a direct affect on performance at ASAT. While these three major groups of factors affect OOD/U qualification, they also have a "direct" effect (i.e., aside from becoming qualified OOD/U or not) on ASAT performance, indicated in the figure by four solid lines for these relationships.

If we were to exclude OOD/U qualification as an explanatory factor, we would obtain what is known as the "total effect" of an explanatory factor on ASAT performance – including the "direct" effect (shown by the solid lines connecting the major groups to ASAT) plus dashed lines from the three major groups to OOD/U). The approach taken in the project is to explicitly account for OOD/U as a separate and independent factor on ASAT performance, resulting in estimating the "direct" effect of demographics and college and navy experience on exam scores and the likelihood of failing an ASAT exam.[3] The objective of multivariate regression analysis is to provide the best estimates of each separate "direct" effect on ASAT performance – controlling for all other measured factors included in the research design.[4]

This regression approach used to analyze ASAT performance differs significantly from the more simple approach used above in describing bivariate relationships. The difference can

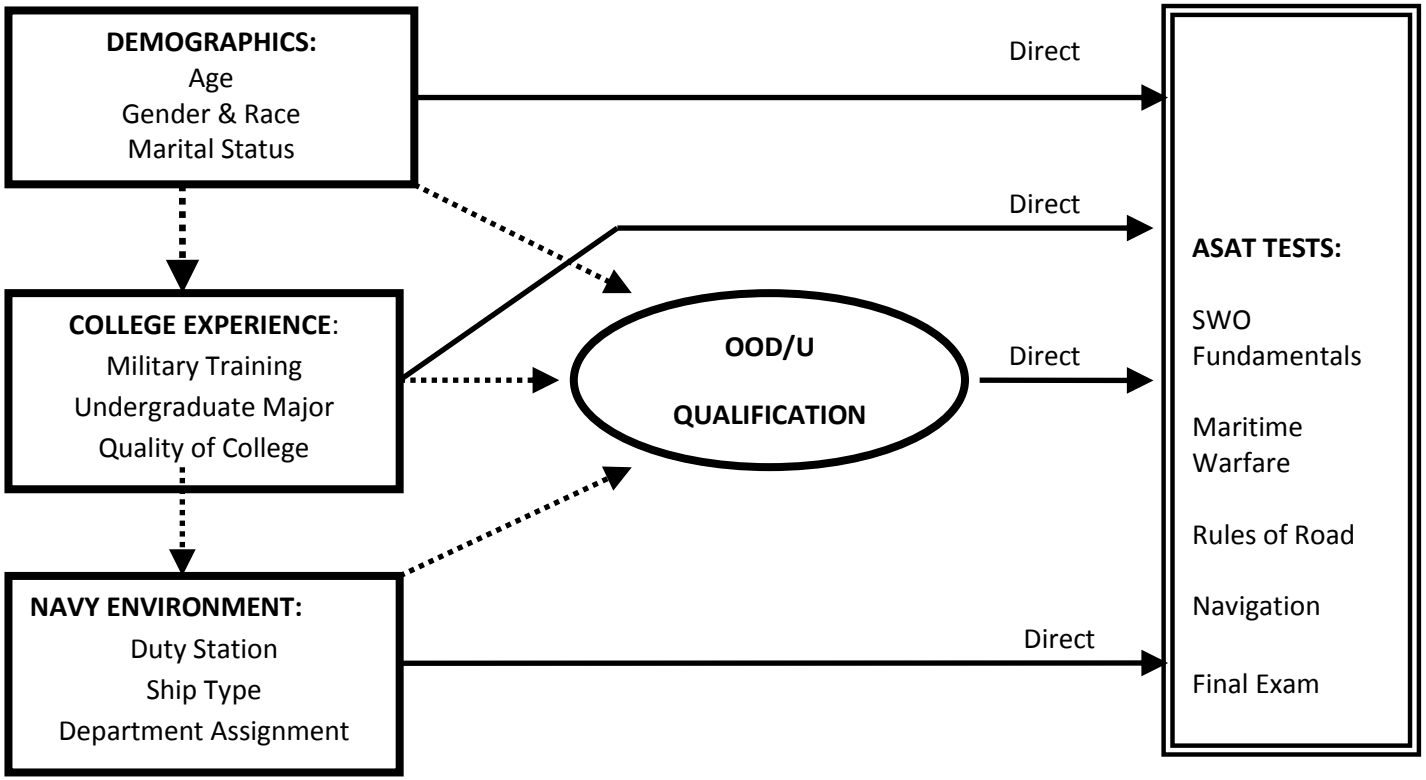
[3] While not shown in the Appendix, models specifying "total" effects, with results indicating that only a small fraction of the total effect is composed of the estimated "indirect" effect via OOD/U qualification. This finding suggests that the three major factors, while affecting OOD/U qualification, have a strong and separate effect on ASAT performance and the "direct" effect estimates shown in the paper are unbiased estimates unaffected by the endogeneity of specifying OOD/U as another explanatory variable when modeling ASAT performance.

[4] The qualitative portion of the project uncovered major explanatory factors of ASAT performance that we were unable to measure and include in the quantitative portion. For example, motivation to do well on ASAT exams was not uniform across the sample as the attitude of the importance of ASAT varied so dramatically across all ships at all duty stations surveyed. Some junior officers were under the impression that it was not necessary or important to use the provided CDs or take the exams included in the disks. These impressions were instilled by the training leadership existing on each ship as well as inherent to the individual junior officer. Some ships encouraged junior officers to study, if not cram, for ASAT and these junior officers reported that they did better than those who did not prepare. Many of the empirical findings seem to support if not suggest that individual motivation is the key factor to ASAT performance and that the motivation does not appear to be highly correlated with many human capital factors specified in the regression model. These and other findings are discussed below.

best be explained by an example. Consider the relationship between a single intervening factor, say commissioning program, and failure rates on the Navigation exam. As seen earlier, Academy graduates are far less likely to fail this exam (18% versus 26% NROTC and 32% OCS) when looking at a simple two-way relationship. We will find, however, when we control for many other individual characteristics (major, quality of college, and duty station-ship assignments) the estimated difference in failing this exam attributed solely to the four-year

FIGURE 5.

FLOW DIAGRAM OF MULTIPLE REGRESSION MODEL OF ASAT PERFORMANCE



Naval Academy military lifestyle immersion experience has no statistically significant difference. That is, regression models attempt to replicate a random experiment whereby commission program selection were the result of a flip of the coin. If this were done, than any differences that would occur later in a classroom setting such as ASAT could be attributed to college experience at the Naval Academy compared to another commissioning source. In essence, we try to account for all the measurable differences of newly commissioned officers and strip off the unique, individual impact of one of these intervening factors. As such, multiple regression modeling may well result in differing outcomes than what we tend to observe in practice. Sometimes the impact of an intervening factor may differ in direction or more often the case may be to lessen or exaggerate the observed impacts we observe in everyday life. The reason there may be such differences is due to more complex interrelationships among the factors themselves. Regression analysis holds these interrelations constant and thus often produces far different results than observed. Given the available quantitative data, the following section presents the best estimates of each individual measurable factor on OOD/U qualification and later ASAT exam performance.

OOD/U Qualification.

The full regression model of whether or not an individual obtains the OOD/U qualification prior to attending the ASAT schoolhouse training program includes a host of explanatory factors, including: individual characteristics (i.e., age, gender, ethnicity, and marital status), pre-commissioning schooling and military indoctrination (i.e., commissioning source, college quality, and academic majors), as well as post-commissioning Navy homeport, ship, and division assignments. The full model specification results are shown in Table A.1 of Appendix A, while Table 12 below shows only the estimated marginal effects that are found to be statistically significant, once all explanatory factors are specified in the multiple regression model.

As explained earlier, the requirement of obtaining one‘s OOD/U qualification prior to attending ASAT was eliminated in March 2009 with Class 239. The last class with available data for statistical analysis was that for Class 273 convening in June 2001, resulting in 1,179 individuals with complete data out of a total of 1,211 who were enrolled during this period. During this period we observe average rates of OOD/U attainment over the three-year period gradually falling from 63.5% in 2009 to 54.0% in 2010, and down to 36.5% for the first half of 2011. During this period and average of 54.2% of ASAT enrollees had attained their OOD/U qualification prior to attending ASAT.

As shown below in Table 12, six explanatory variables are found to be significantly related to attaining one‘s OOD/U qualification prior to ASAT, after specifying all other observed factors in the fully specified model (shown as Table A.1 in Appendix A). Two pre-commissioning factors – ethnicity and commissioning source – are found to be negatively related to the probability of OOD/U attainment. Specifically, African-Americans are 8.4% less likely to have their OOD/U qualification than Whites while graduates of O.C.S. are 5.8% less likely to have

their OOD/U qualification than Naval Academy graduates, regardless of the quality of civilian college attended. These two findings are important to the study in pointing out that there may be groups of officers who, on average, may need to more closely mentored during their early on-board training if they are to earn this important seaboard qualification, which in turn may well help them during later schoolhouse training programs.

The model also indicates how early navy assignment policies may affect the timing of OOD/U qualification. In particular, we find individuals assigned to amphibious ships are 7.4% less likely to attain OOD/U prior to ASAT than those assigned to DDGs, while those on small ships are 11.8% more likely to obtain the qualification before attending ASAT. The actual reason for these findings are left to speculation, and information gleaned from the focus group

Table 12.
Estimated Impacts of Explanatory Factors on Probability of OOD/U Qualification Prior to ASAT (54.2% Average)

FACTOR GROUP	EXPLANATORY FACTOR	REFERENCE CATEGTORY	ESTIMATED MARGINAL EFFECT
Ethnicity	African-American	White	-8.4%
Commissioning Source	O.C.S	Naval Academy	-5.8%
Grade	Ensign	Chief Warrant Officer	+22.5%
Ship Type	Amphibious Ship	Guided Missile Destroyer	-7.4%
	Small Ships	Guided Missile Destroyer	+11.8%
Homeport	Far East	Norfolk	+15.2%

discussion sessions carried out in the study suggests the following. First, ship selection is not a random assignment process but highly driven by academic and military performance of commissioned officers during their college years of experience. While cruiser-destroyers are usually at the top of the wish list of selectees, it is typically thought that those with lower college standings as having to choose what remains on the selection board – mostly amphibious ships. In addition, it was pointed out that the training environments aboard these ships are not centered on surface warfare qualifications to the extent they are aboard CRUDES ships. Both of these factors could well explain why Division Officers aboard these ship types are less likely to qualify OOD/U prior to ASAT. However, the positive finding for those selecting small ships (which account for a relatively small percentage of Division Officers) were attributed to the general belief that junior officers aboard these ships have greater shipboard responsibilities owing to the small number of officers and greater time underway.

Similar explanations for the finding that Division Officers assigned to ships stationed in Japan and Guam may account for the finding that those assigned to these homeports are 15.2% more likely to qualify OOD/U prior to ASAT than those assigned to Norfolk. In particular, focus group discussions generally felt that these ships were operating with foreign navies in a higher operations tempo than ships assigned elsewhere. Shipboard personnel, regardless of their rank (from the Chief's Mess to Commanding Officers), all stressed the positive relationship to time underway and obtaining one's OOD/U – and ships assigned to these Far East ports were simply underway more often and for longer periods of time.

In summary, the model of OOD/U qualification shows many interesting and important reasons of why individuals may or may not obtain this important shipboard qualification prior to attending ASAT. Given the fact that the Navy has allowed a greater and greater portion of its junior officers to attend ASAT without having this qualification, it surely impacts severely on the breadth and depth of information covered n the ~~-a~~dvanced shipboard and training" curriculum offered in this crucial early surface warfare officer training pipeline. Focus group discussions pointed out two impacts this has had on their perspective of ASAT. First, those having gone through ASAT with their OOD/U felt they were at an advantage in learning the material being taught, while second they felt that the curriculum seemed to be changed to focus more on things they already knew since they possessed the skills required in passing the OOD/U qualification. These findings strongly support the re-institution of making OOD/U qualification a requirement for ASAT attendance. Not only will junior officers be better positioned to learn material presented in ASAT, but the information contained in the curriculum may be designed and delivered at a higher level of learning.

Models of ASAT Performance

We next turn our attention to the major statistical models explaining individual performance during the ASAT schoolhouse training program. We focus our attention on the estimated impact of each major explanatory variable – while holding the impact of all other factors constant – on each of five major ASAT exams: SWO Fundamentals, Maritime Warfare, Rules-of-Road, Navigation, and a Final Exam. As explained above, only the first has been continuously administered over all relevant classes, while the others have selectively been administered. We present findings in the text of only those factors that are statistically significant and important significant findings are discussed in the text. One may find all estimated ‗marginal effects' (i.e., differences from the average) of the completely specified models in Appendix A.

The discussion below is organized into four major explanatory variable groups. The first is possession of OOD/U qualification, which we model as having a direct impact on ASAT performance. We then turn our attention to three groups of explanatory factors discussed earlier: demographics, college experience, and navy experience.

OOD/U Qualification

As explained above, regression models are specified for OOD/U qualification separate from performance at ASAT. This approach strongly supports the view that Surface Navy should reinstitute the policy of requiring this important PQS qualification so that the ―leveling experience" can be more uniform and the material covered during ASAT can be taught at a more in-depth and higher level than is currently the case. This view also supports that of many senior leaders interviewed aboard navy ships that the perceived benefits of acquiring the surface warfare pin in a pre-determined constrained amount of time is not worth its cost in terms of giving each junior officer sufficient time and opportunity to truly understand and become operationally proficient in the myriad of PQS requirements that must be obtained prior to becoming fully warfare qualified.

TABLE 13.

Estimated Impact of OOD/U on ASAT Test Scores

MULTIPLE REGRESSION ANALYSIS OF ASAT EXAM RESULTS: *OOD/U Qualification Before ASAT*								
EXAM	EXAM SCORE:				PERCENT FAIL EXAM:			
	AVERAGE SCORE	INDEPENDENT VARIABLE (Not Qualified=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT	AVERAGE FAIL RATE	INDEPENDENT VARIABLE (Not Qualified=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
SWO Fundamentals	80.0		1.6	2.0%	24.7		-6.30	-25.5%
Maritime Warfare	86.9		1.7	2.0%	7.0		-3.9	-55.7%
Rules-of-Road	90.3	OOD/U QUALIFIED	2.1	2.3%	35.7	OOD/U QUALIFIED	-11.5	-32.2%
Navigation	77.0		1.6	2.1%	29.5			0.0%
Final Exam	81.8		2.5	3.1%	10.60		-5.5	-51.9%

*The full model specification is shown below in Table A.11 of Appendix A.

The independent ~~-d~~irect" effect of OOD/U qualification on performance at ASAT is shown above in Table 13. It must be emphasized that these estimates are produced from multiple regression models that control for all other explanatory factors and are the best estimates of how OOD/U qualification itself affects ASAT performance given individual demographics and college experiences as well as navy assignment policies. The estimated OOD/U impacts on variations in the ASAT scores are all statistically significant but one may not fully understand how meaningful these differences are given the relatively small numerical size of the coefficients. To better appreciate the impact of OOD/U we also show the estimated direct impacts of acquiring the OOD/U qualification on the probability that a junior officer will fail an ASAT exam. The results indicate that the impact is statistically significant for all but the recently administered Navigation exam, and having strong and meaningful impacts on the other four exams. For example, we estimate that 18.4% of those OOD/U qualified are expected to fail the SWO Fundamentals exam compared to the 24.7% failure rate of those not having this qualification prior to ASAT (i.e., the estimated delta is -6.3% points, which translates into a 26% lower failure rate). The largest proportional impact is on the Maritime Warfare exam (that is no longer administered) and the recently instituted Final exam. Here we find having an OOD/U qualification can reduce the likelihood of failing by over 50% on these two exams. These results lend strong support for re-instituting the OOD/U qualification as a necessary requirement for ASAT attendance.

ASAT Performance

Since there are so many varied ASAT exams analyzed, the approach taken here is to summarize the most important estimated independent effects of each contributing factor to performance at ASAT and acquiring OOD/U qualification prior to attending ASAT. As noted above, results are categorized by the three major groups of explanatory variables – demographics, college experience, and navy experience.[5]

Demographics

The estimated ~~"d~~irect" impact of demographic variables of age, ethnicity, gender and marital status on ASAT performance and acquiring the OOD/U qualification are shown below in Tables 14-15.

Age. As indicated in Panel (A) of Table 14, age is generally not related to OOD/U qualification except for relatively older junior officers (30+) - mostly are CWOs and attend ASAT on a voluntary basis – who qualify six months later than the average (18 months). Age, when statistically significant, is inversely related to ASAT performance where we observe those older than 23 having lower exam scores and are more likely to fail an exam than the 22-23 aged control group. For example, those 24-29 achieve lower Navigation exam scores and 28.4% are expected to fail the exam (i.e., the estimated rate of failure is 7.8% points greater than those aged 22-23 (20.6%) in the control group. To put all estimated changes on the same scale, we transform the point estimates to proportional changes (i.e., the difference as a percentage of the average) which for the age related difference transforms the +7.8% point differential into a 38% proportional increase in failure rates. Even higher failure rates are expected of those 30 and older (i.e., a 22% point increase and 107% greater failure rate) compared to those 22-23..

Two additional observations may be pointed out from these age related findings that are indicative of regression modeling in general. First, observed differences in exam performance may be non-zero, but the difference is just as likely to be due to chance (we only observe a sample of individuals at any point in time) as due to the contributing factor like age. Regression models provide the decision-maker with the knowledge, based on strong statistical grounds, whether or not to attribute any observed differences to a causal relationship. For example, 26.3% of individuals who are 20-21 years old are observed to fail the Navigation exam as compared to the control group aged 22-23, resulting in an observed 5.7% point difference. (See Table 3 above for these observed statistics.) However, multiple regression analysis, which controls for other factors and takes into account the distribution of failure rates between any two age cohorts, finds the estimated direct effect to be ~~"s~~tatistically insignificant." That is, one should

[5] The full model specifications showing all estimated coefficients and the level of significance for ASAT performance are reported in Tables A.2-A.11.

discount the observed difference due to age as a statistical artifact rather than a causal relationship for the population of junior surface warfare officers.

TABLE 14.

Regression Estimates of Age & Ethnicity on ASAT Performance

(A) Age

MULTIPLE REGRESSION ANALYSIS OF ASAT EXAM RESULTS: *Age*								
EXAM	EXAM SCORE:				PERCENT FAIL EXAM:			
	AVERAGE SCORE	INDEPENDENT VARIABLE (Age 22-23=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE FAIL RATE	INDEPENDENT VARIABLE (Age 22-23=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
SWO Fundamentals	81.2	20-21	1.8	2.2%	20.3	20-21		
		24-29				24-29		
		30+				30+		
Maritime Warfare	88.3	20-21	2.2	2.5%	4.1	20-21		
		24-29				24-29		
		30+	-2.5	-2.8%		30+		
Rules-of-Road	91.8	20-21	1.2	1.3%	28.1	20-21	-6.3	-22.4%
		24-29				24-29		
		30+				30+		
Navigation	80.0	20-21			20.6	20-21		
		24-29	-1.9	-2.4%		24-29	7.8	37.9%
		30+	-7.0	-8.8%		30+	22.0	106.8%
Final Exam	83.3	20-21			6.8	20-21		
		24-29	-1.8	-2.2%		24-29		
		30+	-5.1	-6.1%		30+	21.0	308.8%

EXAM	PERCENT QUALIFIED OOD/U:				MONTHS TO QUALIFY IF OODU QUALIFIED:			
	AVERAGE QUALIFY RATE	INDEPENDENT VARIABLE (Age 22-23=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE MONTHS TO QUALIFY	INDEPENDENT VARIABLE (Age 22-23=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
Officer of the Deck/Underway	53.4%	20-21			18.0	20-21		
		24-29				24-29		
		30+				30+	6.2	34.4%

(B) Ethnicity

MULTIPLE REGRESSION ANALYSIS OF ASAT EXAM RESULTS: *ETHNICITY*								
EXAM	EXAM SCORE:				PERCENT FAIL EXAM:			
	AVERAGE SCORE	INDEPENDENT VARIABLE (White=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE FAIL RATE	INDEPENDENT VARIABLE (White=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
SWO Fundamentals	82.1	Black	-5.9	-7.2%	16.7	Black	24.4	146.1%
		Hispanic	-4.1	-5.0%		Hispanic	12.4	74.3%
		Asian	-8.7	-10.6%		Asian		
		Other				Other	8.5	50.9%
Maritime Warfare	88.5	Black	-1.6	-1.8%	3.8	Black	4.6	121.1%
		Hispanic	-2.1	-2.4%		Hispanic		
		Asian	-1.5	-1.7%		Asian	4.7	123.7%
		Other				Other		
Rules-of-Road	92.0	Black	-3.3	-3.6%	26.8	Black	15.1	56.3%
		Hispanic	-1.7	-1.8%		Hispanic	9.6	35.8%
		Asian				Asian		
		Other				Other		
Navigation	79	Black	-4.9	-6.2%	24.6	Black	22.1	89.8%
		Hispanic				Hispanic	11	44.7%
		Asian				Asian	12.6	51.2%
		Other				Other		
Final Exam	83.4	Black	-4.2	-5.0%	5.6	Black	13.4	239.3%
		Hispanic	-3.4			Hispanic	17.9	319.6%
		Asian				Asian		
		Other				Other		

EXAM	PERCENT QUALIFIED OOD/U:				MONTHS TO QUALIFY IF OODU QUALIFIED:			
	AVERAGE QUALIFY RATE	INDEPENDENT VARIABLE (White=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE MONTHS TO QUALIFY	INDEPENDENT VARIABLE (White=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
Officer of the Deck/Underway	55.0%	Black	-8.4	-15.3%	20.3	Black		
		Hispanic				Hispanic		
		Asian				Asian		
		Other				Other		

The second feature of regression analysis is that the observed difference, even when it is statistically significant, may differ widely from the estimated impact that controls for other intervening factors. This may be best exemplified by comparing observed Navigation failure rates of individuals 30+ as compared to the control group aged 22-23. From Table 3, we find 63.7% of older officers fail the Navigation exam compared to 20.6% of those aged 22-23 - a stunning 43.1% point difference. Regression models, however, predict a much smaller difference. Although the estimated difference is statistically significant, when one holds other factors constant, we find the estimated difference to be 22.0% points higher – roughly one-half of the difference observed.

It is for these two reasons that one builds complex regression models. First, we want to be assured that when we do observe differences, they are most likely due to a (theoretically based) causal relationship rather than an association that may be merely due to chance. Secondly, we want to know what is the independent impact of a single causal factor on an outcome of choice, once we "hold constant" other possible interrelated impacts other factors may have on an outcome.

To summarize, the take-away from investigating the impact of age on ASAT performance is that one should make older officers (mainly LDOs and especially CWOs) aware that they may expect to face a serious challenge when enrolling in ASAT, and perhaps special

resources and/or time may be required to increase their chances of success in this schoolhouse training program.

Ethnicity. Regression results shown in Panel (B) of Table 14 above strongly support the view that racial minorities on average, may be seriously challenged in the ASAT schoolhouse training program. While African-American officers are the only racial minority to be less likely to obtain their OOD/U qualification prior to ASAT compared to white officers (-15.3%), most minorities are likely to achieve lower scores and higher failure rates on various ASAT exams. For example, African-American officers, holding all else constant, are expected to experience exam failure rates from 50% to over 200% higher than that of white officers, while Hispanics may experience 30% to 300% higher failure rates. Knowledge and awareness of these findings is crucial to minority officers becoming more successful at ASAT. Training officers and senior leadership aboard ships need to ensure those who are most likely to face difficulties in the schoolhouse training program find time and guidance on how to better prepare themselves for ASAT. As noted earlier, our interviews with division officers – especially those who experienced "SWOS-in-the-Box" – many times noted how important the CDs were in helping them better understand material directly related to PQS qualifications and material covered in the ASAT classes. These findings suggest that senior leadership at sea reinforce the importance of these CDs with regularly scheduled onboard tests based on this medium. In addition, special 'gouge sessions' may be urged to take place prior to ASAT for those deemed more likely to face challenges during ASAT.

Gender. Results displayed in Table 15 below indicate the role gender plays in early junior surface warfare officer training is for the most part without concern. We find female OOD/U qualification rates prior to ASAT and test scores and failure rates covering material presented during ASAT to be similar to that of their male counterparts. The only exception, that is quite strong, is that females are 60% more likely to fail the SWO Fundamentals exam administered at the very beginning of ASAT than males. Since this finding was first identified in an earlier report (Bowman and Crawford, 2009), we tried to uncover what, if any, factors could be identified to explain this disparity. No one, regardless of grade or rating, seemed to be aware of this outcome and the best one can surmise is that an implicit characteristic of "wardroom culture" might be more conducive to learning and sharing information among males compared with females, for once females come to ASAT, their performance covering material presented is no different than the average male performance. It is also interesting to point out that female OOD/U qualification rates do not differ from males, suggesting that shipboard environments don't negatively affect explicit navy expectations and requirements, but nevertheless may have negative impacts on implicit learning and sharing of information that lie beneath the surface of matters that are of concern to leadership aboard ships.

Marital Status. Estimated impacts of marital status on ASAT performance are shown in Table 15 below. The results are relatively mixed. For example, while married officers are no more or less likely to qualify OOD/U than those not married (mostly single) those that do qualify seem to take somewhat longer to qualify. At ASAT, the performance or married officers differs only in being less likely to fail the Rules-of-Road exam (-16%), but more likely to fail the recently administered Final exam (+77%) than that of single officers. In general, these results do not show any consistent pattern and give us little reason to suspect that married officers are somehow more motivated or more productive as has been found previously.

TABLE 15.

Regression Estimates of Gender & Marital Status

On ASAT Performance

MULTIPLE REGRESSION ANALYSIS OF ASAT EXAM RESULTS: *Gender*

EXAM	EXAM SCORE:				PERCENT FAIL EXAM:			
	AVERAGE SCORE	INDEPENDENT VARIABLE (Male=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE FAIL RATE	INDEPENDENT VARIABLE (Male=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
SWO Fundamentals	81.5		-2.8	-3.4%	18.5%		11.5	62.2%
Maritime Warfare	87.8				4.9%			
Rules-of-Road	91.4	FEMALE			29.7%	FEMALE		
Navigation	78.4		-3.6	-4.6%	28.3%			
Final Exam	82.4				8.9%			

EXAM	PERCENT QUALIFIED OOD/U:				MONTHS TO QUALIFY IF OODU QUALIFIED:			
	AVERAGE QUALIFY RATE	INDEPENDENT VARIABLE (Male=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE MONTHS TO QUALIFY	INDEPENDENT VARIABLE (Male=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
Officer of the Deck/Underway	54.2%	FEMALE			20.9	FEMALE		

MULTIPLE REGRESSION ANALYSIS OF ASAT EXAM RESULTS: *Marital Status*

EXAM	EXAM SCORE:				PERCENT FAIL EXAM:			
	AVERAGE SCORE	INDEPENDENT VARIABLE (Not Married=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE FAIL RATE	INDEPENDENT VARIABLE (Not Married=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
SWO Fundamentals	81.0				21.4%			
Maritime Warfare	88.0		0.9	1.0%	4.8%			
Rules-of-Road	91.5	MARRIED	0.8	0.9%	29.5%	MARRIED	-4.8	-16.3%
Navigation	78.7				26.1%			
Final Exam	83.0				6.6%		5.1	77.3%

EXAM	PERCENT QUALIFIED OOD/U:				MONTHS TO QUALIFY IF OODU QUALIFIED:			
	AVERAGE QUALIFY RATE	INDEPENDENT VARIABLE (Not Married=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE MONTHS TO QUALIFY	INDEPENDENT VARIABLE (Not Married=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
Officer of the Deck/Underway	53.3%	MARRIED			17.9	MARRIED	4.3	24.0%

College Experience

As discussed above, the regression model includes three factors when explaining the impact of college experience on the early training of Division Officers prior to being fully warfare qualified, including: commissioning program, college quality, and undergraduate major selection.

Commissioning Program and College Quality. To better understand the impact of commissioning program on the early training of surface warfare junior officers, the report interacts commissioning program (e.g., Naval Academy, NROTC, and OCS) with college quality. The reason for this explicit interrelationship is based on the premise that experience

TABLE 16.

Commissioning Program, College Quality and ASAT Performance

MULTIPLE REGRESSION ANALYSIS OF ASAT EXAM RESULTS: *COMMISSIONING PROGRAM & COLLEGE QUALITY*								
EXAM	EXAM SCORE:				PERCENT FAIL EXAM:			
	AVERAGE SCORE	INDEPENDENT VARIABLE (USNA & Competitive=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE FAIL RATE	INDEPENDENT VARIABLE (USNA & Competitive=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
SWO Fundamentals	81.7	N.R.O.T.C.			19.4	N.R.O.T.C.		
		O.C.S.	-1.2	-1.5%		O.C.S.		
		E.C.P.	1.8	2.2%		E.C.P.		
		Most Competitive	3.3	4.0%		Most Competitive		
		Least Competitive	-3.1	-3.8%		Least Competitive	11.3	58.2%
		Limited Duty Officer				Limited Duty Officer		
		Chief Warrant Officer				Chief Warrant Officer	-7.1	-36.6%
Maritime Warfare	88.4	N.R.O.T.C.			4.2	N.R.O.T.C.		
		O.C.S.				O.C.S.		
		E.C.P.				E.C.P.		
		Most Competitive	3.3	3.7%		Most Competitive		
		Least Competitive				Least Competitive		
		Limited Duty Officer				Limited Duty Officer		
		Chief Warrant Officer	-2.2	-2.5%		Chief Warrant Officer	6.9	164.3%
Rules-of-Road	91.9	N.R.O.T.C.			28.0	N.R.O.T.C.		
		O.C.S.				O.C.S.		
		E.C.P.	2.1	2.3%		E.C.P.	-12.6	-45.0%
		Most Competitive	3.1	3.4%		Most Competitive	-13.5	-48.2%
		Least Competitive				Least Competitive		
		Limited Duty Officer	2.7	2.9%		Limited Duty Officer		
		Chief Warrant Officer	-4.0	-4.4%		Chief Warrant Officer		
Navigation	80.6	N.R.O.T.C.	-2.3	-2.9%	18.6	N.R.O.T.C.		
		O.C.S.	-2.7	-3.3%		O.C.S.		
		E.C.P.		0.0%		E.C.P.	-12.6	-67.7%
		Most Competitive	3.1	3.8%		Most Competitive	-13.5	-72.6%
		Least Competitive		0.0%		Least Competitive		
		Limited Duty Officer	2.7	3.3%		Limited Duty Officer		
		Chief Warrant Officer	-4.0	-5.0%		Chief Warrant Officer		
Final Exam	83.7	N.R.O.T.C.			4.5	N.R.O.T.C.		
		O.C.S.				O.C.S.		
		E.C.P.				E.C.P.		
		Most Competitive				Most Competitive		
		Least Competitive	-3.6	-4.3%		Least Competitive	7.4	164.4%
		Limited Duty Officer				Limited Duty Officer		
		Chief Warrant Officer				Chief Warrant Officer		

EXAM	PERCENT QUALIFIED OOD/U:				MONTHS TO QUALIFY IF OODU QUALIFIED:			
	AVERAGE QUALIFY RATE	INDEPENDENT VARIABLE (USNA & Competitive=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE MONTHS TO QUALIFY	INDEPENDENT VARIABLE (USNA & Competitive=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
Officer of the Deck/Underway	56.3%	N.R.O.T.C.			18.5	N.R.O.T.C.		
		O.C.S.	-5.8	-10.3%		O.C.S.		
		E.C.P.				E.C.P.		
		Most Competitive				Most Competitive		
		Least Competitive				Least Competitive		
		Limited Duty Officer				Limited Duty Officer		
		Chief Warrant Officer				Chief Warrant Officer		

acquired at the Naval Academy, since it is among the most selective colleges in the country, combines two interrelated aspects of college experience. First, it provides a round-the-clock military lifestyle twelve months a year for four years. Second, midshipmen selected from high school applicants typically come from the top 20% of their high school class and have combined

SAT scores in excess of 1200. To make more accurate comparisons of college graduates, we separate NROTC and OCS graduates into those coming from schools comparable to that of the Naval Academy (~~m~~most competitive") versus two other groups including the 90% who comprise the control group from moderately selective civilian colleges and those at the bottom end of college quality (~~l~~ess/non competitive") spectrum.

The estimated impacts on ASAT performance of NROTC and OCS graduates from moderately selective colleges compared with Naval Academy graduates are listed under the main headings of NROTC and OCS. But to obtain the results of NROTC or OCS graduates of most or least selective schools, one must add the above coefficients on NROTC or OCS variables to those of the most or least competitive college variables. As an example, we notice that the OCS graduate of moderately competitive colleges is 5.8% less likely to qualify OOD/U than Academy graduates (56.3%), but there are no additional differences found among OCS graduates who came from highly selective or non-selective compared to OCS graduates from competitive colleges (i.e., these coefficients are statistically insignificant and not reported in the table). In essence, all OCS graduates – regardless of college selectivity – face significant challenges to becoming OOD/U qualified prior to ASAT. Once again, our interviews with the fleet uncovered repeated experiences of OCS graduates lamenting the fact that the first time they ever set foot aboard a ship was the day they reported to duty after INTRO training. They literally didn't know fore from aft. The results of this report strongly support the notion that the scholarship graduates of the Naval Academy and NROTC have an edge up on those coming right out of OCS and from the very start of their careers, OCS graduates are at a disadvantage that has not yet been made up during the early training programs for surface warfare officers.

Next, we see from Table 16 that commissioning program and college quality seem to affect ASAT performance but their independent impacts differ by types of exams. Quite surprisingly, NROTC and OCS graduates from moderately or most competitive colleges do no worse or better than Academy graduates on the SWO Fundamentals exam, but only graduates from less/non competitive colleges are nearly 60% more likely to fail this exam covering material they should have learned during their first 18-20 months aboard ships. There are three interesting conclusions one can draw from this finding. First, while OCS graduates on average may not acquire the needed skills to become OOD/U qualified like Academy and NROTC graduates, only those graduating from less selective colleges face serious challenges to learning basic knowledge required for junior surface warfare fundamentals. In essence, navy officer recruiters should have incentives to fill their desired quotas from moderately or highly selective civilian colleges and minimize their efforts of recruiting at less/non-selective colleges .

The second interesting outcome is implicit in finding *no statistical differences* in failure rates on the ASAT exams between OCS graduates of most competitive or even moderately competitive colleges compared to Naval Academy graduates who have been immersed in four years of military training at a most selective college.

Thirdly, differences between these groups, when significant, are attributed to the selectivity of the college rather than the military training received at the college. For example, graduates of most competitive civilian colleges are almost 50% less likely to fail the Rules-of-

Road and Navigation exam than Academy graduates. Apparently ASAT exams are construed in such a way that either pre-commissioning military training is only marginally related or

graduates with prior military training in college are less motivated to take and pass these exams.[6]

Another interesting finding reported in the table shows prior-service commissioned officers to be 45% less likely to fail the Rules-of-Road and Navigation exams than college graduates not having prior enlisted service. The only significant differences found among non-commissioned officers are that CWOs are 37% less likely to fail the SWO Fundamentals exam but over 150% more likely to fail the Maritime Warfare exam. One possible explanation for these findings is that more senior enlisted personnel understand better the basic fundamental skills required of a Division Officer, but do not excel in learning maritime strategy in a classroom setting.

Undergraduate Major. Regression modeling results shown in Table 17 are interesting in showing what, if any, relationships can be supported between ASAT performance and one‘s undergraduate major. The first thing to notice in this regard is the lack of relationship between one‘s undergraduate major, either technical or non-technical, and one‘s propensity to acquire OOD/U qualification prior to ASAT, other than the fact it takes non-engineering technical majors longer to acquire this qualification than social science major

[6] Interviews carried out onboard ships did uncover at times an attitude, especially among Academy graduates, that they had learned much of this material once before and didn’t see great value in relearning the material that may have seemed mundane to them compared to OCS graduates.

TABLE 17.

Undergraduate Major & ASAT Performance

MULTIPLE REGRESSION ANALYSIS OF ASAT EXAM RESULTS: *Undergraduate Major*

EXAM	EXAM SCORE: AVERAGE SCORE	INDEPENDENT VARIABLE (Social Sciences=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	PERCENT FAIL EXAM: AVERAGE FAIL RATE	INDEPENDENT VARIABLE (Social Sciences=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
SWO Fundamentals	80.0	Engineering	2.8	3.5%	23.5	Engineering	-6.8	-28.9%
		Math-Physical Sciences	2.1	2.6%		Math-Physical Sciences	-4.2	-17.9%
		Biological Sciences	1.3	1.6%		Biological Sciences		
		Humanities				Humanities		
		Other				Other		
Maritime Warfare	87.9	Engineering	1.8	2.0%	4.1	Engineering		
		Math-Physical Sciences	1.4	1.6%		Math-Physical Sciences		
		Biological Sciences				Biological Sciences		
		Humanities				Humanities		
		Other				Other		
Rules-of-Road	90.6	Engineering	1.9	2.1%	32.7	Engineering	-5.9	-18.0%
		Math-Physical Sciences				Math-Physical Sciences		
		Biological Sciences	1.9	2.1%		Biological Sciences	-9.0	-27.5%
		Humanities				Humanities		
		Other				Other		
Navigation	76.3	Engineering	4.2	5.5%	33.7	Engineering	-13.9	-41.2%
		Math-Physical Sciences	2.4	3.1%		Math-Physical Sciences	-9.7	-28.8%
		Biological Sciences				Biological Sciences		
		Humanities	3.6	4.7%		Humanities		
		Other				Other		
Final Exam	82.2	Engineering	2.3	2.8%	8.5	Engineering		
		Math-Physical Sciences				Math-Physical Sciences		
		Biological Sciences				Biological Sciences		
		Humanities	-2.4	-2.9%		Humanities		
		Other				Other		

EXAM	PERCENT QUALIFIED OOD/U: AVERAGE QUALIFY RATE	INDEPENDENT VARIABLE (Social Sciences=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	MONTHS TO QUALIFY IF OODU QUALIFIED: AVERAGE MONTHS TO QUALIFY	INDEPENDENT VARIABLE (Social Sciences=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
Officer of the Deck/Underway	51.1%	Engineering			18.4	Engineering		
		Math-Physical Sciences				Math-Physical Sciences	3.4	18.5%
		Biological Sciences				Biological Sciences	3.0	16.3%
		Humanities				Humanities		
		Other				Other		

Statistical relationships between college major and ASAT performance on test scores are often found to exist mainly by engineers and math/physical science majors achieving higher scores than social science majors. Furthermore, engineers are less likely to fail SWO Fundamentals (-29%), Rules-of-Road (-18%), and Navigation (-41%) compared to social science majors. These findings support the emphasis Surface Navy places on engineering majors among its scholarship Academy and NROTC programs, but one must keep in mind these findings refer to classroom training experience and not shipboard experience (e.g., achieving OOD/U qualification).

Navy Experience

The last group of explanatory variables specified in the early training models of junior surface warfare officers is that encompassed in navy experience, including: duty station and ship type selection and department assignments made by a ship's command.

Duty Station. As explained above, over half of newly commissioned surface warfare officers come from scholarship programs that allow graduates to chose their first duty station and ship type according to how well they did in their academic and military training courses in college. Those with the best grades have greater choices from which to select than those scoring lower in the pecking order. As seen in Panel (A) of Table 18 below, duty station appears to only affect the likelihood of someone obtaining their OOD/U qualification prior to ASAT for those having Japan/Guam as their homeports – where it is estimated that holding all else constant those based in the far Pacific are 30% more likely to qualify OOD/U than those in Norfolk, while all other observed differences across duty stations are not statistically significant. As discussed earlier, many stories were told about the increased optempo and underway time of ships based in Japan, which can explain such findings.

Other differences in scores on ASAT exams and duty stations are found in the regression models, with strong negative relationships uncovered related to failing the Rules-of-Road exam. In particular, junior officers from all homeports other than Japan/Guam had lower fail rates on this exam compared to ships based in Norfolk, ranging from -16% (San Diego) to -37% (Pearl Harbor). It is important to keep in mind that the composition of ship types that differ across duty stations is controlled for in the multiple regression models, so that these estimates reflect the individual impact duty stations have on ASAT performance – separate from ship type effects.

San Diego also stands out from the rest in regards to officers based there experience lower fail rates on SWO Fundamentals (-15%) and Navigation (-21%) exams. Similarly those based in the FL/TX/MI homeports (mainly Mayport, FL) have significantly lower fail rates on SWO Fundamentals (-27%) and Rules-of-Road (-19%) than officers based in Norfolk. As explained earlier, we believe these differences most likely reflect unobserved college

performance (via self-selecting more favorable duty stations) rather than differences that exist due to ships‘ scheduled underway time or time spent in repairs.

Ship Type. There is a long tradition in the surface navy favoring assignment to major combatants (CGs and especially DDGs) over amphibious or other ship types.[7] As shown in Panel (B) in Table 18 below, modeling results of the estimated impact of ship type on acquiring OOD/U qualification prior to ASAT finds those assigned to amphibious ships are13.7% less likely to be qualified compared to those assigned to DDGs, while there is no significant

TABLE 18.

Duty Station, Ship Type and ASAT Performance

(A) Duty Station

MULTIPLE REGRESSION ANALYSIS OF ASAT EXAM RESULTS: *Duty Station*								
EXAM	EXAM SCORE:				PERCENT FAIL EXAM:			
	AVERAGE SCORE	INDEPENDENT VARIABLE (Norfolk=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE FAIL RATE	INDEPENDENT VARIABLE (Norfolk=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
SWO Fundamentals	79.6	Japan-Guam	1.4	1.8%	24.9	Japan-Guam		
		Pearl Harbor				Pearl Harbor		
		San Diego	1.5	1.9%		San Diego	-3.8	-15.3%
		Washington				Washington		
		FL-TX-MI	2.3	2.9%		FL-TX-MI	-6.6	-26.5%
Maritime Warfare	86.8	Japan-Guam			6.6	Japan-Guam		
		Pearl Harbor				Pearl Harbor		
		San Diego	1.5	1.7%		San Diego		
		Washington	2.7	3.1%		Washington	-5.5	-83.3%
		FL-TX-MI	1.7	2.0%		FL-TX-MI		
Rules-of-Road	90.4	Japan-Guam	0.9	1.0%	34.9	Japan-Guam		
		Pearl Harbor	1.5	1.7%		Pearl Harbor	-12.8	-36.7%
		San Diego	0.9	1.0%		San Diego	-5.5	-15.8%
		Washington	1.9	2.1%		Washington	-10.8	-30.9%
		FL-TX-MI	1.9	2.1%		FL-TX-MI	-6.7	-19.2%
Navigation	76.4	Japan-Guam			33.7	Japan-Guam		
		Pearl Harbor	-3.6	-4.7%		Pearl Harbor		
		San Diego	1.7	2.2%		San Diego	-7.2	-21.4%
		Washington	2.2	2.9%		Washington		
		FL-TX-MI				FL-TX-MI		
Final Exam	82.3	Japan-Guam			9.1	Japan-Guam		
		Pearl Harbor				Pearl Harbor		
		San Diego	2.0	2.4%		San Diego		
		Washington				Washington		
		FL-TX-MI				FL-TX-MI		

EXAM	PERCENT QUALIFIED OOD/U:				MONTHS TO QUALIFY IF OODU QUALIFIED:			
	AVERAGE QUALIFY RATE	INDEPENDENT VARIABLE (Norfolk=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE MONTHS TO QUALIFY	INDEPENDENT VARIABLE (Norfolk=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
Officer of the Deck/Underway	51.0%	Japan-Guam	15.2	29.8%	21.4	Japan-Guam		
		Pearl Harbor				Pearl Harbor		
		San Diego				San Diego		
		Washington				Washington		
		FL-TX-MI				FL-TX-MI		

[7] Newly commissioned officers today are not assigned to large deck carriers, however, the Division Officer data set includes LDOs and CWOs who may be assigned to them.

(B) Ship Type

MULTIPLE REGRESSION ANALYSIS OF ASAT EXAM RESULTS: *Ship Type*								
EXAM	EXAM SCORE:				PERCENT FAIL EXAM:			
	AVERAGE SCORE	INDEPENDENT VARIABLE (Destroyer=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE FAIL RATE	INDEPENDENT VARIABLE (Destroyer=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
SWO Fundamentals	82.3	Frigates	-2.5	-3.0%	16.4	Frigates	7.1	43.3%
		Cruisers				Cruisers		
		Amphibious	-2.2	-2.7%		Amphibious	8.1	49.4%
		Other	-4.2	-5.1%		Other	17.0	103.7%
Maritime Warfare	89.5	Frigates	-2.2	-2.5%	3.1	Frigates		
		Cruisers				Cruisers		
		Amphibious	-1.9	-2.1%		Amphibious	3.2	103.2%
		Other	-5.0	-5.6%		Other	10.0	322.6%
Rules-of-Road	91.7	Frigates			28.7	Frigates		
		Cruisers				Cruisers		
		Amphibious				Amphibious		
		Other				Other		
Navigation	79.5	Frigates			24.5	Frigates		
		Cruisers	-4.3	-5.4%		Cruisers	10.8	44.1%
		Amphibious				Amphibious		
		Other				Other		
Final Exam	83.2	Frigates			8.7	Frigates		
		Cruisers				Cruisers		
		Amphibious				Amphibious		
		Other	-5.2	-6.3%		Other	15.3	175.9%

EXAM	PERCENT QUALIFIED OOD/U:				MONTHS TO QUALIFY IF OODU QUALIFIED:			
	AVERAGE QUALIFY RATE	INDEPENDENT VARIABLE (Destroyer=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE MONTHS TO QUALIFY	INDEPENDENT VARIABLE (Destroyer=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
Officer of the Deck/Underway	54.2%	Frigates			19.8	Frigates		
		Cruisers				Cruisers		
		Amphibious	-7.4	-13.7%		Amphibious		
		Other	11.8	21.8%		Other		

difference found among FFGs or CGs relative to destroyers. There are no surprises here, other than perhaps the finding that officers assigned to ~~o~~ther" ship types that comprise only 6% of all ship types, are over 20% more likely to qualify than those on DDGs. Some or most of this may be attributed to those choosing minesweepers where junior officers have more responsibility and greater underway time than other ships. It may also be related to non-commissioned officers serving in similar shipboard environments aboard large deck carriers.

Department Assignments. As expected, regression model findings related to department assignments and early junior officer training performance show no clear pattern. However there are a few relationships noteworthy for discussion. First, department assignment by senior leadership aboard ships does not appear to affect one's ability to acquire OOD/U qualification other than a few having to take more months to qualify (Operations and the unassigned ‗Deck/Executive' codes). Some department assignments are, however, related to performance on many ASAT exams. For example, those without major DIVO responsibilities are more likely to fail the SWO Fundamentals exam (+52%), the Maritime Warfare exam (+750%), and the Rules-of-Road exam (+38%) compared to those assigned to the Weapons Division.[8] As

[8] It may be noted that the relatively large estimated impacts in proportional terms result because of the unusually low failure rate on the Maritime Warfare exam of those in the control group assigned to the Weapons Division.

TABLE 19.

Department Assignment & ASAT Performance

MULTIPLE REGRESSION ANALYSIS OF ASAT EXAM RESULTS: *Department Assignment*								
EXAM	EXAM SCORE:				PERCENT FAIL EXAM:			
	AVERAGE SCORE	INDEPENDENT VARIABLE (Weapons=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE FAIL RATE	INDEPENDENT VARIABLE (Weapons=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
SWO Fundamentals	82.1	Combat Systems			17.3	Combat Systems		
		Operations				Operations		
		Engineering				Engineering		
		Navigation				Navigation	-19.2	-111.0%
		Deck/Executive	-1.5	-1.8%		Deck/Executive	9.0	52.0%
Maritime Warfare	90.6	Combat Systems	-1.4	-1.5%	0.7	Combat Systems		
		Operations		0.0%		Operations		
		Engineering	-1.9	-2.1%		Engineering	3.9	557.1%
		Navigation		0.0%		Navigation		
		Deck/Executive	-3.2	-3.5%		Deck/Executive	5.3	757.1%
Rules-of-Road	92.3	Combat Systems			25.6	Combat Systems		
		Operations	-1.0	-1.1%		Operations	6.6	25.8%
		Engineering		0.0%		Engineering		
		Navigation		0.0%		Navigation		
		Deck/Executive	-2.6	-2.8%		Deck/Executive	9.7	37.9%
Navigation	78.5	Combat Systems			25.6	Combat Systems		
		Operations				Operations		
		Engineering				Engineering		
		Navigation				Navigation		
		Deck/Executive				Deck/Executive		
Final Exam	83.1	Combat Systems			8.1	Combat Systems		
		Operations				Operations		
		Engineering				Engineering		
		Navigation				Navigation		
		Deck/Executive	-4.2	-5.1%		Deck/Executive		

EXAM	PERCENT QUALIFIED OOD/U:				MONTHS TO QUALIFY IF OODU QUALIFIED:			
	AVERAGE QUALIFY RATE	INDEPENDENT VARIABLE (Weapons=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE	AVERAGE MONTHS TO QUALIFY	INDEPENDENT VARIABLE (Weapons=Control)	EST'D POINT CHANGE	EST'D PERCENTAGE POINT CHANGE
Officer of the Deck/Underway	51.4%	Combat Systems			16.4	Combat Systems		
		Operations				Operations	6.9	42.1%
		Engineering				Engineering		
		Navigation				Navigation		
		Deck/Executive				Deck/Executive	3.2	19.5%

explained earlier, it's not clear why these ~~u~~nassigned" junior officers fare so poorly, but regardless of the reason these findings suggest that the policy of simply bringing more and more ensigns onboard ships with hopes of later filling Department Head slots with quality surface warfare officers may not be the optimal personnel policy to follow. Setting young officers up for failure may not only have negative effects on those who become the forgotten' but excess untrained junior officers also impinge upon the constrained time of senior enlisted chiefs, experienced junior officers as well as Department Heads, thus reducing the overall quality of junior officer training aboard ships.

SWO Fundamentals Forecast Models

The regression model results given in the previous section lay the groundwork for building predictive models that may be used as a counseling tool for senior enlisted personnel and officers responsible for the training of young DIVOs as they progress toward their surface warfare pin. In particular, existing information from early schoolhouse training programs can be combined and used to build predictive models of success aboard ships (e.g., becoming OOD/U qualified by a pre-designated time) as well as passing tests and exams designed to be part of their early training (e.g., ASAT exams).

Construction of Forecast Models

We have chosen to provide one such predictive model – that of passing the SWO Fundamentals exam at ASAT. This exam is administered during the first day or two of ASAT and is designed to capture basic knowledge that young DIVOs should understand over their first 18 months of service aboard their ship. A non-linear regression model (binary logistic) is used to predict the probability of a junior surface warfare officer has of failing the exam. Since having the OOD/U qualification is so crucial to ASAT performance, in Table 20 below, we show the estimated probabilities of failing the SWO Fundamentals exam for individuals by selected characteristics for both those who have acquired the qualification separate from those who don‘t.

TABLE 20.

Estimated Probability of Failing SWO Fundamentals Exam

for Selected Factors by OOD/U Qualification Status

		OOD/U Qualified		Differential	
		No	Yes	Points	Proportion
Total:		21.8%	15.5%	-6.3%	-28.9%
Gender:					
	Male	**19.1%**	**13.5%**	-5.6%	-29.3%
	Female	32.6%	24.2%	-8.4%	-25.8%
Ethnicity:					
	White	**18.6%**	**13.1%**	-5.5%	-29.6%
	Black	44.6%	34.7%	-9.9%	-22.2%
	Hispanic	32.5%	24.1%	-8.4%	-25.8%
Source:					
	USNA	**20.2%**	**14.3%**	-5.9%	-29.2%
	NROTC/MC	14.1%	9.8%	-4.3%	-30.5%
	OCS/LC	37.4%	28.2%	-9.2%	-24.6%
Ship Type:					
	DDG	**18.0%**	**12.7%**	-5.3%	-29.4%
	CG	26.8%	19.4%	-7.4%	-27.6%
	FFG	18.8%	13.2%	-5.6%	-29.8%
	AMPHIB	27.0%	19.6%	-7.4%	-27.4%
Duty Station:					
	Norfolk	**25.0%**	**18.0%**	-7.0%	-28.0%
	San Diego	20.3%	14.4%	-5.9%	-29.1%
	Washington	23.1%	16.5%	-6.6%	-28.6%
	Pear Harbor	21.7%	15.5%	-6.2%	-28.6%
	Japan/Guam	21.6%	15.3%	-6.3%	-29.2%
	FL/TX/MI	17.0%	11.9%	-5.1%	-30.0%

The non-linearities of OOD/U qualification are explicitly shown in these figures, where for example males having the OOD/U qualification are predicted to have failure rates 29% lower on the SWO Fundamentals exam than males without the qualification, whereas the estimated probability is estimated to be 26% lower for females lacking OOD/U. Implicitly, one can also calculate non-linearities in estimates for other explanatory variables. For example, among officers who don‘t qualify OOD/U prior to ASAT, the probability of failing the exam is 9% points higher for those assigned to an amphibious ship compared to those on DDGs, whereas the differential due to these two ship types is only 6.9% among those already OOD/U qualified. It may be argued that the non-linear interrelationships allowed in these logistic model specifications better approximates real-world outcomes than the more simple independent effects characteristic of linear regression modeling.

As such, logit models are used below to give shipboard personnel and ASAT training personnel estimates of how likely a junior officer may fail the SWO Fundamentals exam given personal characteristics and choices made prior to commissioning as well as choices made after commissioning. The four examples shown below are instructive in that the reader can

more clearly see how estimated impacts from all these interrelated choices add up so that those with relatively high failure rate probabilities can be better identified at the start of their careers. It might then be possible to use various early intervention strategies directed to at-risk junior officers that may enhance their chances of success in the PQS qualification process as well as at classroom training required during the early stages of their military careers.

We offer four selected patterns of choices representative junior surface warfare officers may take regarding commissioning programs at various types of colleges and their undergraduate majors, and later making duty station-ship type selections, and finally being assigned as DIVO to a specific department aboard their first ship. In the first two scenarios (Panels (A) and (B)) of Figure 6, a typical white female of average age at commissioning is projected to have a 24% chance of failing the SWO Fundamentals exam at ASAT. If we further choose among this initial sub-set only those who graduate from a moderately competitive college (i.e., of average selectivity) out of OCS with a social science major, the expected failure rate rises to over 30% (already an increase of 25% from the initial sub-set). If the college graduate is at the top of her class, her chances of success doesn't differ much from the initial average for white females, but if we follow the selected sub-set who may have ranked near the bottom of OCS graduates and is left with an FFG based in Norfolk, we find her chance of failing the exam is now over 40%. Finally, her expected chance of failing SWO Fundamentals would be expected to improve to one-in-three if the CO assigns her the DIVO of Combat Systems Department, but to fall to one-in-two if not assigned to any specific department. In the latter scenario, we find the predicted failure rate to have doubled relative to the average sub-set depicted.

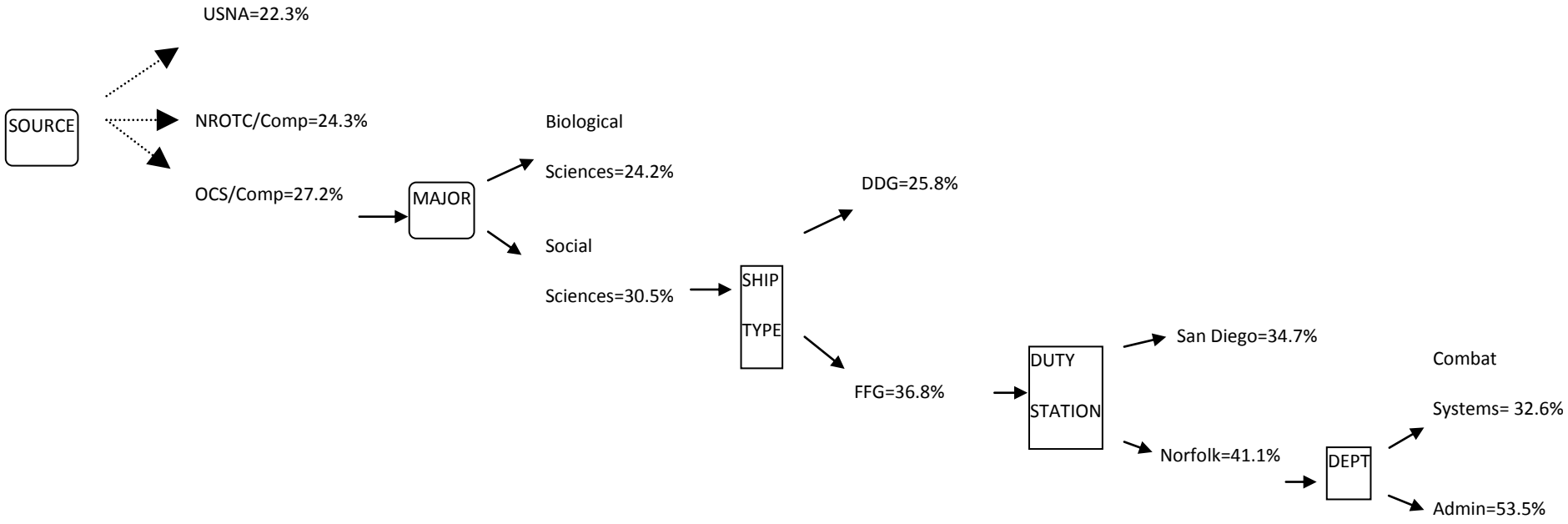
The importance of becoming OOD/U qualified is next shown in Panel(B) of Figure 6, by having the same type of junior officer come into the fleet with the same college experience and be given the same assignments as above. Here we find a 28.4% expected failure rate for this same cohort as we now follow the joint probabilities along the path of someone who does not qualify OOD/U prior to ASAT. If assigned to a frigate out of Norfolk, their expected failure rate increases to 46.4%, with a final expected failure rate on SWOS Fundamentals to range between 38% to near 60%.

First, comparison of these two trajectories of exam failure/success once more points out how important gaining one's OOD/U qualification is to later schoolhouse success. Second, we can more clearly see the role assignment policies and strategies have on an individual's success at ASAT. For example, these models can help identify individuals with college experience combinations that are more likely than others to be _at-risk' when coming to ASAT. COs of ships, for example, could ensure that these _at-risk' junior officers be paired with strong

FIGURE 6.

ESTIMATED JOINT PROBABILITIES OF FAILING SWO FUNDAMENTALS EXAM

(A) White / Female / Age 22-23: *24.0%* Probability of Failing Exam



(B) White / Female / Age 22-23/ Not OODU Qualified: *28.4%* Probability of Failing Exam

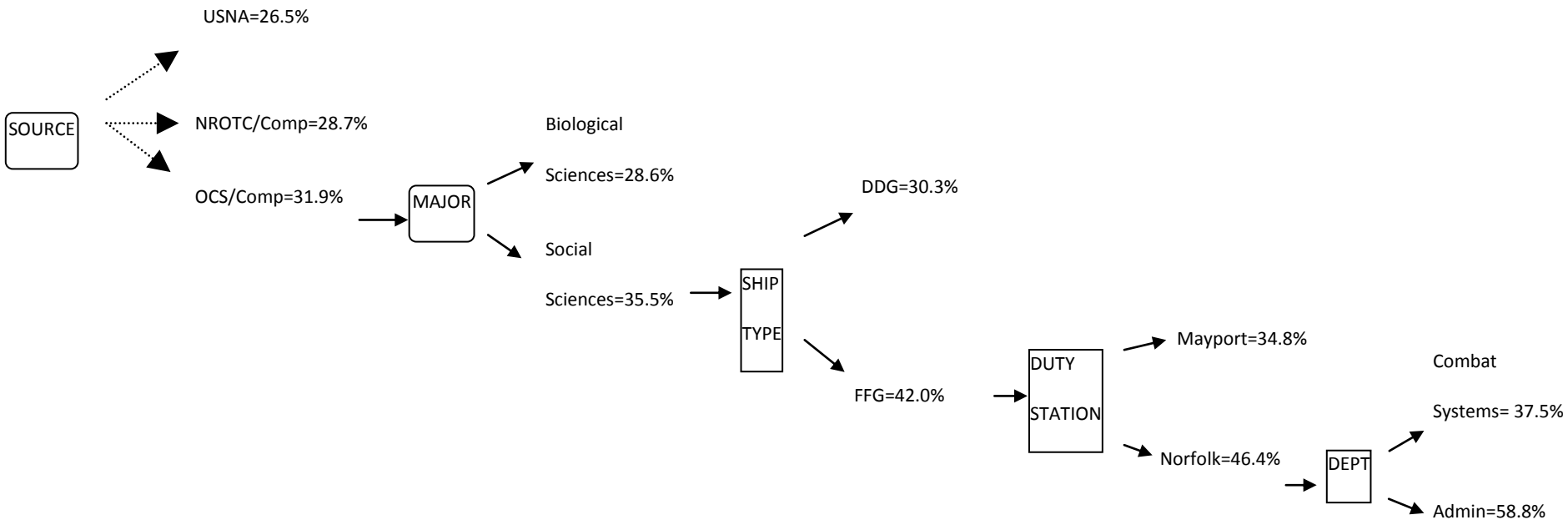
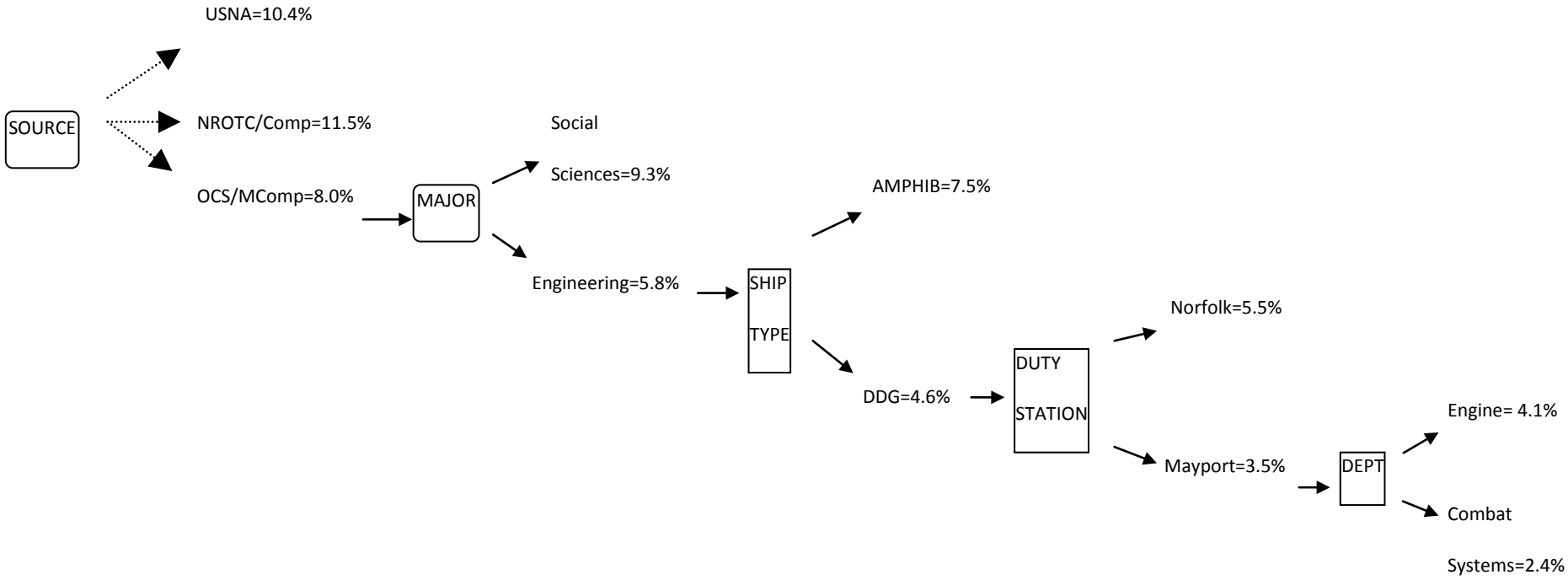


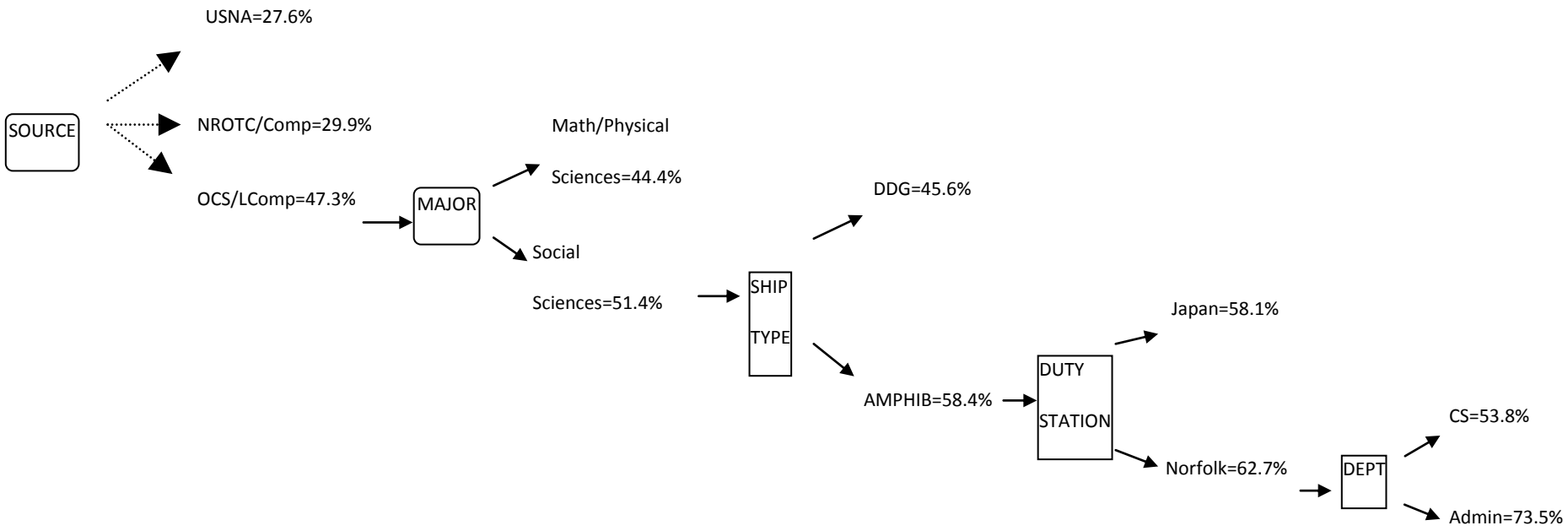
FIGURE 6. (Continued)

ESTIMATED JOINT PROBABILITIES OF FAILING SWO FUNDAMENTALS EXAM

(C) White / Male / Age 22-23/ OODU Qualified: *11.3%* Probability of Failing Exam



(D) / Hispanic / Male / Age 24-29/ Not OODU Qualified: *29.5%* Probability of Failing Exam



second tour Lieutenants, Chiefs, or Department Heads. The ship's Training Officer could also ensure that the "at-risk' junior officers be given special time and responsibilities to learn material critical to the basic fundamental skills required of DIVOs. Finally, special resources at ASAT could also be directed to these could also be directed to these "at-risk' officers.

To show the range of expectations of exam failure we next refer to two relatively extreme examples of junior officers and the choices/assignments made by each. In Panel (A) of Figure 6, we follow the expected failure rate probabilities of a white male aged 22 from a most selective civilian college with an engineering major who receives an OCS commission. He obtains his OOD/U qualification prior to ASAT and is predicted to have less than a 6% chance of failing the SWO Fundamentals exam. If he has done well in college his chances fall to 3.5% as perhaps he was able to select a DDG out of Mayport, Fl. Finally, if he is chosen to be DIVO of the Combat Systems Department he has only a 2.4% chance of failure at ASAT.

This above pattern of joint probabilities stands in contrast to a Hispanic male officer aged 24 coming to the navy from a less competitive civilian college with a social science major and who does not obtain his OOD/U qualification prior to ASAT. This individual already stands a one-in-two chance of failing the SWO Fundamentals exam. If he was near the bottom of his class out of college and say, can only select an amphibious ship out of Norfolk, his chances of failure rise to two-out-of-three. His chances of failure once more are affected in the end by department assignment, where we estimate his probability to fail the exam to range from 50% if assigned Combat Systems DIVO to over 70% if not given a specific DIVO assignment.

The above scenarios are clearly instructive that success or failure at ASAT is the result of many interrelated factors, some of which are external to the ship or navy culture, but other intervening choices involving Surface Navy assignment policies also play an important role in the success or failure of junior surface warfare officers progressing through their early training pipeline.

Use of Forecast Models

If one were interested in using predictive models of ASAT success to identify "at-risk' junior officers, then one must have a clear understanding of how such models might be used in terms of predicting accurately the pass-fail outcomes of junior officers. The distribution of the estimated probability of failing the SWO Fundamentals exam based on the logit model specified earlier is given in Figure 7 below. If we wish to identify "at-risk' junior officers, we could choose a threshold failure rate for which to classify someone as either "at-risk' or "not at-risk.' To do this we can make two types of errors. First, we might classify someone "at-risk' but in fact passes the exam. Giving these individuals extra help or directing special resources to his/her success at ASAT would be wasting time and money. Second, we might classify someone as "not at risk' but who in fact does fail the ASAT exam. In these cases, we would not be directing special resources to where they are most helpful. These two cases of errors are better known as "false

positive errors" (someone who doesn't need special treatment but gets it) and "false negative errors" (someone who should receive special treatment but doesn't get it).

Both of these types of forecast errors, along with overall forecast accuracy measures are presented below in Table 21. From the table we observe a clear trade-off when choosing a threshold failure rate to classify "at-risk" junior officers. The higher the threshold probability of failing an exam that we set, the less "false positive" errors we make (wasting resources on those who shouldn't get it) and the more "false negative" errors we make (overlooking those who should get special treatment but don't). If the latter error is deemed more serious to make then we may opt for a lower threshold of failure, meaning we would have to spend more money on delivering more special services to those whose predictive failure rate exceeds, say, 20%. Our model tells us that we would correctly classify two-out-of-three junior officers, and only have to experience slightly over 10% "false negative" predictions – whereby we think someone doesn't require special attention but in fact does.

As noted, however, by choosing a lower failure rate threshold, we may seriously constrain budgets needed to deliver additional resources designed to improve ASAT exam performance. These budget constraints are likely to move us in the other direction whereby we only offer special services to those with relatively high failure rate probabilities. In this case, we would tend to not waste time and resources on individuals who really don't require special

FIGURE 7.

Estimated Prediction Probability of Failing SWO Fundamentals Exam

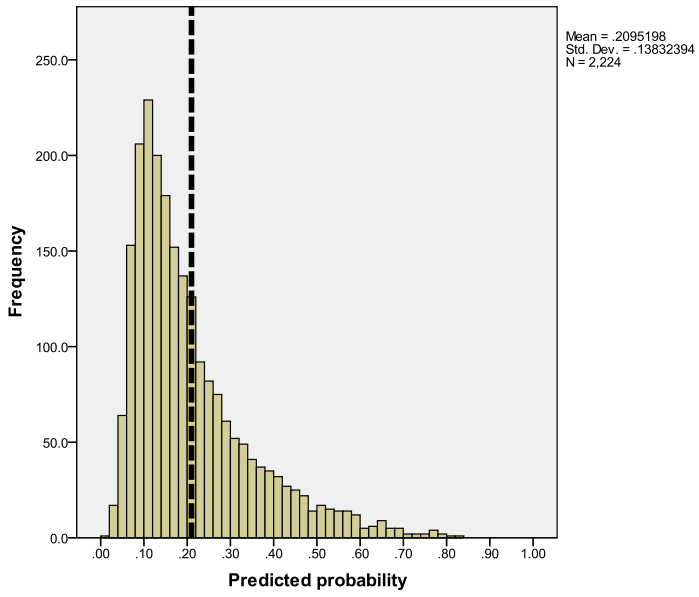


TABLE 21 .

Analysis of Prediction Accuracy Under Differing

Classifications of Failing SWO Fundamentals Exam

Threshold Predicted Failure Probability	Predicted to Fail:		Cases Correctly Predicted:		False 'Positives'		False 'Negatives'	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
21%	827	37.0%	1519	68.5%	528	64.2%	170	12.2%
30%	449	20.3%	1689	76.2%	256	57.0%	272	15.3%
40%	236	10.6%	1748	78.8%	120	50.8%	349	17.6%
50%	116	5.5%	1762	80.0%	53	45.7%	402	23.4%
Actual Number Fail = 465; Percent Fail = 21.0%								

attention, but we would withhold special resources more and more from those who truly benefit from special resources that are directed toward success in ASAT exams.

Another way to use the predictive results is in the setting of personal counseling between a mentor and a junior surface warfare officer. Here we don‘t have to be concerned with cost savings from differing ASAT threshold exam failure rates. Rather a mentor could be provided estimated probabilities of exam fail rates for his/her mentee based on the predictive logit model specified above. The mentor could use these predictions along with other observed behavior when counseling whether or not a junior officer should exert special effort towards preparing for an ASAT exam (or other modeled outcome like OOD/U qualification). For example, the mentor would be provided the following table that gives observed probabilities of failing the SWO Fundamental exam based upon ranges of predicted failure rates. If the junior officer‘s predicted fail rate falls, say, in the ‗high‘ classification then he or she would know they face a 50% chance of failing the exam unless they undertake special efforts to prepare for ASAT.

TABLE 22.

Predicted Probabilities of Failing SWO Fundamentals Exam

ESTIMATED CHANCE OF FAILING SWO FUNDAMENTALS EXAM AT ASAT		
AT-RISK CLASSIFICATION	ESTIMATED PROBABILITY	ACTUAL PROBABILITY
LOW	<20%	1:10
LO-MIDDLE	20%-29%	1:4
HI-MIDDLE	30-39%	1:3
HIGH	40%+	1:2

Currently, the policy is to send junior officers off to ASAT without any knowledge of how likely they are to be successful in passing the administered exams. Current personnel information exists that could easily be used to assist individual junior officers to achieve greater success in their early training pipeline, and perhaps directing specific resources to those most in need of assistance to ensure greater success in the training process. Ignoring such information is setting some junior officers up for failure, when it is possible to provide early intervention assistance to those more in need and when they need it the most.

Table A.1

OLS MODELS OF OFFICER-OF-THE-DECK QUALIFICATION: Probability of Qualifying Before ASAT

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	0.520	0.038		13.852	0.000
AGE2021	0.037	0.036	0.023	1.026	0.305
AGE2429	-0.041	0.032	-0.037	-1.297	0.195
AGE30PL	-0.015	0.058	-0.010	-0.257	0.797
FEMALE	0.020	0.026	0.017	0.768	0.443
ETHBLK	-0.084	0.037	-0.049	-2.240	0.025
ETHHIS	-0.035	0.045	-0.016	-0.773	0.440
ETHASN	-0.058	0.044	-0.028	-1.308	0.191
ETHOTH	0.029	0.058	0.011	0.508	0.612
CSNROTC	-0.040	0.029	-0.035	-1.375	0.169
CSOCS	-0.058	0.034	-0.053	-1.714	0.087
CSECP	0.037	0.058	0.016	0.642	0.521
CSLDO	-0.015	0.073	-0.007	-0.201	0.840
CSCWO	0.225	0.084	0.131	2.683	0.007
COLLMC	-0.015	0.052	-0.006	-0.297	0.767
COLLLC	0.031	0.043	0.016	0.723	0.470
MAJENG	0.025	0.029	0.019	0.843	0.399
MAJMSCI	0.021	0.032	0.014	0.642	0.521
MAJBSCI	-0.004	0.044	-0.002	-0.087	0.931
MAJHUM	0.054	0.042	0.029	1.292	0.196
MAJOTH	-0.013	0.066	-0.004	-0.195	0.846
MARRIED	0.013	0.026	0.012	0.486	0.627
SHIPFFG	-0.003	0.037	-0.002	-0.085	0.932
SHIPCG	-0.006	0.032	-0.004	-0.176	0.860
SHIPAMP	-0.074	0.030	-0.063	-2.479	0.013
SHIPOTH	0.118	0.061	0.043	1.923	0.055
PORTGJAP	0.152	0.036	0.097	4.226	0.000
PORTPRL	-0.037	0.045	-0.019	-0.826	0.409
PORTSDG	0.020	0.026	0.018	0.762	0.446
PORTWAS	0.022	0.060	0.008	0.364	0.716
PORTFTI	0.024	0.039	0.016	0.615	0.539
DEPCS	-0.008	0.038	-0.007	-0.225	0.822
DEPNAV	-0.105	0.141	-0.016	-0.749	0.454
DEPOPS	0.016	0.034	0.014	0.482	0.630
DEPENG	0.036	0.034	0.032	1.058	0.290
DEPOTH	0.054	0.046	0.032	1.175	0.240

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.211	.044	.029	.491

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	25	35	.700	2.904	.000
Residual	528	2188	.241		
Total	552	2223			

OLS MODELS OF TIME TO ACQUIRE OFFICER-OF-THE-DECK QUALIFICATION: Months (Ensigns Only)

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	15.321	1.484		10.327	0.000
AGE2021	-0.166	1.380	-0.004	-0.120	0.904
AGE2429	0.285	1.334	0.008	0.213	0.831
AGE30PL	6.163	2.323	0.149	2.653	0.008
FEMALE	-0.708	1.040	-0.020	-0.681	0.496
ETHBLK	-1.860	1.544	-0.034	-1.205	0.229
ETHHIS	-1.706	1.783	-0.027	-0.957	0.339
ETHASN	1.484	1.803	0.023	0.823	0.411
ETHOTH	-2.455	2.141	-0.032	-1.147	0.252
CSNROTC	-0.431	1.136	-0.013	-0.379	0.705
CSOCS	-0.657	1.394	-0.019	-0.472	0.637
CSECP	1.013	2.257	0.015	0.449	0.654
CSLDO	-0.975	2.510	-0.018	-0.389	0.698
CSCWO	3.726	3.137	0.081	1.188	0.235
COLLMC	1.552	2.144	0.021	0.724	0.469
COLLLC	-0.496	1.705	-0.008	-0.291	0.771
MAJENG	1.451	1.170	0.037	1.241	0.215
MAJMSCI	3.383	1.277	0.078	2.649	0.008
MAJBSCI	2.988	1.764	0.049	1.694	0.091
MAJHUM	0.504	1.612	0.009	0.313	0.755
MAJOTH	2.323	2.615	0.025	0.888	0.375
MARRIED	4.282	1.018	0.135	4.204	0.000
SHIPFFG	-4.273	1.443	-0.100	-2.960	0.003
SHIPCG	-2.867	1.279	-0.067	-2.241	0.025
SHIPAMP	1.440	1.233	0.039	1.168	0.243
SHIPOTH	-0.234	2.155	-0.003	-0.109	0.914
PORTGJAP	1.439	1.324	0.033	1.087	0.277
PORTPRL	-0.509	1.880	-0.008	-0.271	0.786
PORTSDG	-1.071	1.050	-0.033	-1.020	0.308
PORTWAS	-1.474	2.307	-0.019	-0.639	0.523
PORTFTI	-0.223	1.508	-0.005	-0.148	0.883
DEPCS	-0.057	1.510	-0.001	-0.037	0.970
DEPNAV	-0.485	6.473	-0.002	-0.075	0.940
DEPOPS	6.928	1.353	0.202	5.120	0.000
DEPENG	1.370	1.335	0.041	1.026	0.305
DEPOTH	3.193	1.821	0.064	1.753	0.080

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.390	.152	.126	14.036

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	40360	35	1153	5.854	.000
Residual	225363	1144	197		
Total	265723	1179			

Table A.2

OLS MODELS OF SURFACE WARFARE FUNDAMENTALS: Mean Score

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	82.000	0.637		128.704	0.000
AGE2021	1.844	0.604	0.064	3.051	0.002
AGE2429	-0.447	0.540	-0.022	-0.827	0.409
AGE30PL	-0.929	0.975	-0.035	-0.952	0.341
FEMALE	-2.753	0.448	-0.129	-6.142	0.000
ETHBLK	-6.085	0.632	-0.198	-9.634	0.000
ETHHIS	-4.159	0.757	-0.110	-5.493	0.000
ETHASN	-0.971	0.752	-0.026	-1.291	0.197
ETHOTH	-1.500	0.982	-0.030	-1.527	0.127
CSNROTC	-0.687	0.488	-0.034	-1.407	0.159
CSOCS	-1.302	0.570	-0.066	-2.282	0.023
CSECP	1.898	0.984	0.046	1.928	0.054
CSLDO	0.151	1.240	0.004	0.122	0.903
CSCWO	-0.412	1.419	-0.013	-0.290	0.772
COLLMC	3.241	0.883	0.075	3.669	0.000
COLLLC	-3.095	0.729	-0.088	-4.244	0.000
MAJENG	2.824	0.501	0.120	5.639	0.000
MAJMSCI	2.137	0.546	0.082	3.915	0.000
MAJBSCI	1.258	0.750	0.035	1.678	0.094
MAJHUM	0.755	0.717	0.022	1.053	0.292
MAJOTH	0.695	1.112	0.013	0.625	0.532
MARRIED	0.619	0.437	0.032	1.416	0.157
SHIPFFG	-2.485	0.626	-0.097	-3.970	0.000
SHIPCG	-0.679	0.544	-0.027	-1.248	0.212
SHIPAMP	-2.324	0.510	-0.109	-4.561	0.000
SHIPOTH	-4.009	1.036	-0.081	-3.868	0.000
PORTGJAP	1.688	0.609	0.060	2.771	0.006
PORTPRL	0.602	0.757	0.017	0.795	0.427
PORTSDG	1.540	0.446	0.078	3.453	0.001
PORTWAS	1.115	1.025	0.023	1.088	0.277
PORTFTI	2.368	0.657	0.087	3.606	0.000
DEPCS	0.916	0.639	0.039	1.433	0.152
DEPNAV	2.585	2.383	0.022	1.085	0.278
DEPOPS	0.271	0.574	0.013	0.472	0.637
DEPENG	-0.130	0.569	-0.007	-0.229	0.819
DEPOTH	-1.399	0.784	-0.046	-1.784	0.075

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.400	.160	.146	8.315

ANOVA Table

	Sum of Squares	df	Mean Square	F	Sig.
Regression	28643	35	818	11.838	.000
Residual	150781	2181	69		
Total	179425	2216			

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	81.148	0.661		122.696	0.000
AGE2021	1.784	0.602	0.062	2.965	0.003
AGE2429	-0.382	0.538	-0.019	-0.709	0.478
AGE30PL	-0.905	0.971	-0.034	-0.932	0.351
FEMALE	-2.785	0.446	-0.130	-6.240	0.000
ETHBLK	-5.949	0.629	-0.193	-9.451	0.000
ETHHIS	-4.104	0.754	-0.109	-5.443	0.000
ETHASN	-0.871	0.749	-0.023	-1.163	0.245
ETHOTH	-1.549	0.978	-0.031	-1.584	0.113
CSNROTC	-0.620	0.486	-0.031	-1.276	0.202
CSOCS	-1.209	0.568	-0.061	-2.129	0.033
CSECP	1.835	0.980	0.044	1.872	0.061
CSLDO	0.177	1.234	0.005	0.144	0.886
CSCWO	-0.784	1.415	-0.025	-0.554	0.580
COLLMC	3.264	0.879	0.076	3.712	0.000
COLLLC	-3.141	0.726	-0.089	-4.327	0.000
MAJENG	2.786	0.499	0.118	5.589	0.000
MAJMSCI	2.101	0.543	0.081	3.866	0.000
MAJBSCI	1.262	0.746	0.035	1.692	0.091
MAJHUM	0.662	0.714	0.019	0.927	0.354
MAJOTH	0.716	1.107	0.013	0.646	0.518
MARRIED	0.601	0.435	0.031	1.381	0.167
SHIPFFG	-2.486	0.623	-0.097	-3.989	0.000
SHIPCG	-0.674	0.542	-0.027	-1.243	0.214
SHIPAMP	-2.206	0.508	-0.104	-4.343	0.000
SHIPOTH	-4.206	1.033	-0.085	-4.073	0.000
PORTGJAP	1.439	0.609	0.051	2.363	0.018
PORTPRL	0.660	0.754	0.019	0.876	0.381
PORTSDG	1.505	0.444	0.077	3.390	0.001
PORTWAS	1.077	1.020	0.022	1.055	0.291
PORTFTI	2.331	0.654	0.086	3.566	0.000
DEPCS	0.936	0.637	0.040	1.470	0.142
DEPNAV	2.760	2.372	0.023	1.164	0.245
DEPOPS	0.248	0.572	0.012	0.434	0.665
DEPENG	-0.189	0.567	-0.009	-0.333	0.739
DEPOTH	-1.483	0.781	-0.049	-1.899	0.058
OODUQUAL	1.641	0.361	0.091	4.549	0.000

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.409	.168	.154	8.277

ANOVA Table

	Sum of Squares	df	Mean Square	F	Sig.
Regression	30061	36	835	12.188	.000
Residual	149363	2180	69		
Total	179425	2216			

Table A.3

OLS MODELS OF SURFACE WARFARE FUNDAMENTALS: Probability of Failing Exam

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	0.146	0.030		4.892	0.000
AGE2021	-0.029	0.028	-0.022	-1.012	0.312
AGE2429	0.007	0.025	0.008	0.280	0.779
AGE30PL	0.013	0.046	0.011	0.281	0.779
FEMALE	0.114	0.021	0.117	5.422	0.000
ETHBLK	0.249	0.029	0.179	8.432	0.000
ETHHIS	0.126	0.035	0.074	3.576	0.000
ETHASN	0.043	0.035	0.025	1.215	0.224
ETHOTH	0.084	0.046	0.037	1.822	0.069
CSNROTC	0.022	0.023	0.024	0.971	0.332
CSOCS	0.046	0.027	0.051	1.725	0.085
CSECP	-0.072	0.046	-0.039	-1.572	0.116
CSLDO	-0.015	0.058	-0.009	-0.252	0.801
CSCWO	0.000	0.066	0.000	0.000	1.000
COLLMC	-0.070	0.041	-0.036	-1.701	0.089
COLLLC	0.111	0.034	0.069	3.257	0.001
MAJENG	-0.070	0.023	-0.065	-2.982	0.003
MAJMSCI	-0.044	0.025	-0.037	-1.717	0.086
MAJBSCI	-0.046	0.035	-0.028	-1.323	0.186
MAJHUM	-0.021	0.033	-0.014	-0.640	0.522
MAJOTH	-0.028	0.052	-0.011	-0.530	0.596
MARRIED	-0.015	0.020	-0.017	-0.732	0.464
SHIPFFG	0.071	0.029	0.061	2.427	0.015
SHIPCG	0.002	0.025	0.002	0.093	0.926
SHIPAMP	0.086	0.024	0.089	3.605	0.000
SHIPOTH	0.163	0.048	0.072	3.364	0.001
PORTGJAP	-0.037	0.028	-0.029	-1.286	0.199
PORTPRL	-0.023	0.035	-0.014	-0.654	0.513
PORTSDG	-0.040	0.021	-0.045	-1.910	0.056
PORTWAS	-0.017	0.048	-0.008	-0.363	0.716
PORTFTI	-0.067	0.031	-0.055	-2.195	0.028
DEPCS	-0.047	0.030	-0.045	-1.575	0.115
DEPNAV	-0.185	0.111	-0.035	-1.663	0.096
DEPOPS	-0.019	0.027	-0.020	-0.695	0.487
DEPENG	0.025	0.027	0.027	0.928	0.353
DEPOTH	0.087	0.037	0.063	2.364	0.018

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.324	.105	.091	.388

ANOVA Table

	Sum of Squares	df	Mean Square	F	Sig.
Regression	39	35	1.104	7.319	.000
Residual	329	2181	.151		
Total	367	2216			

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	0.178	0.031		5.756	0.000
AGE2021	-0.026	0.028	-0.020	-0.933	0.351
AGE2429	0.005	0.025	0.005	0.183	0.855
AGE30PL	0.012	0.045	0.010	0.262	0.793
FEMALE	0.115	0.021	0.119	5.496	0.000
ETHBLK	0.244	0.029	0.175	8.271	0.000
ETHHIS	0.124	0.035	0.073	3.526	0.000
ETHASN	0.039	0.035	0.023	1.109	0.267
ETHOTH	0.085	0.046	0.038	1.868	0.062
CSNROTC	0.020	0.023	0.021	0.862	0.389
CSOCS	0.042	0.027	0.047	1.596	0.111
CSECP	-0.070	0.046	-0.037	-1.524	0.128
CSLDO	-0.016	0.058	-0.009	-0.270	0.787
CSCWO	0.014	0.066	0.010	0.214	0.830
COLLMC	-0.071	0.041	-0.036	-1.727	0.084
COLLLC	0.113	0.034	0.071	3.318	0.001
MAJENG	-0.068	0.023	-0.064	-2.929	0.003
MAJMSCI	-0.042	0.025	-0.036	-1.668	0.096
MAJBSCI	-0.046	0.035	-0.028	-1.332	0.183
MAJHUM	-0.018	0.033	-0.011	-0.535	0.592
MAJOTH	-0.028	0.052	-0.011	-0.547	0.584
MARRIED	-0.014	0.020	-0.016	-0.700	0.484
SHIPFFG	0.071	0.029	0.061	2.434	0.015
SHIPCG	0.002	0.025	0.002	0.085	0.932
SHIPAMP	0.081	0.024	0.085	3.421	0.001
SHIPOTH	0.170	0.048	0.076	3.526	0.000
PORTGJAP	-0.027	0.028	-0.021	-0.951	0.342
PORTPRL	-0.025	0.035	-0.016	-0.718	0.473
PORTSDG	-0.038	0.021	-0.043	-1.852	0.064
PORTWAS	-0.016	0.048	-0.007	-0.334	0.739
PORTFTI	-0.066	0.031	-0.054	-2.156	0.031
DEPCS	-0.048	0.030	-0.045	-1.605	0.109
DEPNAV	-0.192	0.111	-0.036	-1.728	0.084
DEPOPS	-0.018	0.027	-0.019	-0.664	0.507
DEPENG	0.027	0.027	0.030	1.015	0.310
DEPOTH	0.090	0.037	0.066	2.458	0.014
OODUQUAL	-0.063	0.017	-0.077	-3.709	0.000

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.333	.111	.096	.387

ANOVA Table

	Sum of Squares	df	Mean Square	F	Sig.
Regression	41	36	1.130	7.539	.000
Residual	327	2180	.150		
Total	367	2216			

Table A.4

OLS MODELS OF MARITIME WARFARE: Mean Score

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	89.305	0.670		133.371	0.000
AGE2021	2.256	0.626	0.088	3.603	0.000
AGE2429	-0.979	0.568	-0.054	-1.723	0.085
AGE30PL	-2.571	0.995	-0.117	-2.585	0.010
FEMALE	-0.400	0.468	-0.021	-0.855	0.393
ETHBLK	-1.656	0.650	-0.061	-2.548	0.011
ETHHIS	-2.119	0.773	-0.064	-2.742	0.006
ETHASN	-1.616	0.769	-0.049	-2.101	0.036
ETHOTH	-0.135	0.937	-0.003	-0.144	0.885
CSNROTC	-0.675	0.503	-0.038	-1.341	0.180
CSOCS	0.468	0.606	0.026	0.772	0.440
CSECP	1.370	0.972	0.040	1.409	0.159
CSLDO	2.007	1.125	0.068	1.785	0.075
CSCWO	-1.917	1.368	-0.078	-1.402	0.161
COLLMC	3.239	0.904	0.085	3.584	0.000
COLLLC	-0.652	0.790	-0.020	-0.825	0.409
MAJENG	1.809	0.515	0.087	3.515	0.000
MAJMSCI	0.899	0.571	0.039	1.576	0.115
MAJBSCI	1.432	0.730	0.047	1.962	0.050
MAJHUM	-0.084	0.743	-0.003	-0.113	0.910
MAJOTH	0.810	1.199	0.016	0.676	0.499
MARRIED	0.907	0.448	0.054	2.025	0.043
SHIPFFG	-2.338	0.640	-0.106	-3.651	0.000
SHIPCG	-0.860	0.560	-0.038	-1.534	0.125
SHIPAMP	-2.063	0.529	-0.110	-3.903	0.000
SHIPOTH	-4.820	1.096	-0.106	-4.397	0.000
PORTGJAP	1.274	0.632	0.050	2.015	0.044
PORTPRL	0.219	0.799	0.007	0.274	0.784
PORTSDG	1.528	0.458	0.088	3.340	0.001
PORTWAS	2.666	1.027	0.063	2.596	0.010
PORTFTI	1.727	0.663	0.075	2.607	0.009
DEPCS	-1.335	0.667	-0.065	-2.001	0.046
DEPNAV	1.255	2.592	0.011	0.484	0.628
DEPOPS	-0.697	0.601	-0.038	-1.160	0.246
DEPENG	-1.862	0.597	-0.105	-3.120	0.002
DEPOTH	-3.159	0.801	-0.121	-3.946	0.000

Model Summary

Model		R	R Square	Adjusted R Square	Std. Error of the Estimate
	1	.351	.123	.105	7.5244

ANOVA Table

	Sum of Squares	df	Mean Square	F	Sig.
Regression	13527	35	386	6.826	.000
Residual	96136	1698	57		
Total	109662	1733			

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	88.305	0.702		125.758	0.000
AGE2021	2.185	0.623	0.085	3.508	0.000
AGE2429	-0.866	0.565	-0.048	-1.533	0.126
AGE30PL	-2.500	0.989	-0.114	-2.528	0.012
FEMALE	-0.431	0.465	-0.022	-0.927	0.354
ETHBLK	-1.550	0.647	-0.057	-2.397	0.017
ETHHIS	-2.073	0.769	-0.062	-2.698	0.007
ETHASN	-1.478	0.766	-0.045	-1.930	0.054
ETHOTH	-0.154	0.932	-0.004	-0.165	0.869
CSNROTC	-0.621	0.501	-0.035	-1.241	0.215
CSOCS	0.488	0.602	0.027	0.810	0.418
CSECP	1.326	0.967	0.039	1.372	0.170
CSLDO	2.047	1.119	0.069	1.830	0.067
CSCWO	-2.235	1.362	-0.091	-1.641	0.101
COLLMC	3.314	0.899	0.087	3.687	0.000
COLLLC	-0.653	0.785	-0.020	-0.831	0.406
MAJENG	1.795	0.512	0.086	3.506	0.000
MAJMSCI	0.893	0.567	0.038	1.573	0.116
MAJBSCI	1.442	0.726	0.048	1.987	0.047
MAJHUM	-0.127	0.739	-0.004	-0.172	0.863
MAJOTH	0.815	1.192	0.016	0.684	0.494
MARRIED	0.891	0.446	0.053	1.999	0.046
SHIPFFG	-2.211	0.637	-0.100	-3.470	0.001
SHIPCG	-0.816	0.557	-0.036	-1.464	0.143
SHIPAMP	-1.888	0.527	-0.101	-3.583	0.000
SHIPOTH	-4.987	1.091	-0.110	-4.572	0.000
PORTGJAP	0.949	0.633	0.037	1.499	0.134
PORTPRL	0.265	0.794	0.008	0.334	0.739
PORTSDG	1.508	0.455	0.087	3.315	0.001
PORTWAS	2.693	1.021	0.063	2.636	0.008
PORTFTI	1.658	0.659	0.072	2.515	0.012
DEPCS	-1.362	0.663	-0.067	-2.053	0.040
DEPNAV	1.409	2.578	0.013	0.547	0.585
DEPOPS	-0.717	0.598	-0.039	-1.199	0.231
DEPENG	-1.935	0.594	-0.109	-3.259	0.001
DEPOTH	-3.243	0.796	-0.125	-4.072	0.000
OODUQUAL	1.682	0.375	0.104	4.486	0.000

Model Summary

Model		R	R Square	Adjusted R Square	Std. Error of the Estimate
		.366	.134	.115	7.4824

ANOVA Table

	Sum of Squares	df	Mean Square	F	Sig.
Regression	14653	36	407	7.270	.000
Residual	95009	1697	56		
Total	109662	1733			

Table A.5

OLS MODELS OF MARITIME WARFARE: Probability of Failing Exam

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	0.021	0.019		1.119	0.263
AGE2021	-0.016	0.018	-0.023	-0.899	0.369
AGE2429	0.001	0.016	0.002	0.052	0.958
AGE30PL	0.040	0.028	0.067	1.438	0.151
FEMALE	0.009	0.013	0.017	0.655	0.513
ETHBLK	0.048	0.018	0.065	2.634	0.009
ETHHIS	0.025	0.022	0.028	1.157	0.247
ETHASN	0.050	0.022	0.056	2.304	0.021
ETHOTH	-0.017	0.026	-0.016	-0.654	0.513
CSNROTC	0.008	0.014	0.017	0.595	0.552
CSOCS	0.000	0.017	-0.001	-0.020	0.984
CSECP	-0.028	0.027	-0.030	-1.020	0.308
CSLDO	-0.034	0.032	-0.042	-1.075	0.282
CSCWO	0.062	0.038	0.093	1.612	0.107
COLLMC	-0.010	0.025	-0.010	-0.411	0.681
COLLLC	-0.004	0.022	-0.004	-0.169	0.866
MAJENG	-0.022	0.014	-0.040	-1.549	0.122
MAJMSCI	-0.008	0.016	-0.012	-0.482	0.630
MAJBSCI	-0.025	0.021	-0.030	-1.214	0.225
MAJHUM	0.031	0.021	0.037	1.471	0.142
MAJOTH	-0.022	0.034	-0.016	-0.656	0.512
MARRIED	-0.017	0.013	-0.036	-1.311	0.190
SHIPFFG	0.015	0.018	0.025	0.847	0.397
SHIPCG	-0.015	0.016	-0.025	-0.967	0.334
SHIPAMP	0.036	0.015	0.070	2.402	0.016
SHIPOTH	0.096	0.031	0.078	3.104	0.002
PORTGJAP	-0.028	0.018	-0.041	-1.578	0.115
PORTPRL	0.001	0.022	0.002	0.061	0.951
PORTSDG	-0.014	0.013	-0.030	-1.113	0.266
PORTWAS	-0.055	0.029	-0.048	-1.897	0.058
PORTFTI	-0.009	0.019	-0.015	-0.492	0.623
DEPCS	0.010	0.019	0.017	0.514	0.607
DEPNAV	-0.045	0.073	-0.015	-0.613	0.540
DEPOPS	0.003	0.017	0.006	0.182	0.856
DEPENG	0.038	0.017	0.078	2.240	0.025
DEPOTH	0.051	0.023	0.073	2.277	0.023

Model Summary

Model		R	R Square	Adjusted R Square	Std. Error of the Estimate
	1	.244	.059	.040	.212

ANOVA Table

	Sum of Squares	df	Mean Square	F	Sig.
Regression	5	35	.137	3.060	.000
Residual	76	1698	.045		

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	0.045	0.020		2.251	0.025
AGE2021	-0.014	0.018	-0.020	-0.808	0.419
AGE2429	-0.002	0.016	-0.004	-0.113	0.910
AGE30PL	0.039	0.028	0.065	1.384	0.167
FEMALE	0.009	0.013	0.018	0.713	0.476
ETHBLK	0.046	0.018	0.062	2.506	0.012
ETHHIS	0.024	0.022	0.027	1.112	0.266
ETHASN	0.047	0.022	0.052	2.160	0.031
ETHOTH	-0.017	0.026	-0.015	-0.640	0.522
CSNROTC	0.007	0.014	0.015	0.508	0.612
CSOCS	-0.001	0.017	-0.002	-0.048	0.962
CSECP	-0.027	0.027	-0.029	-0.987	0.324
CSLDO	-0.035	0.032	-0.044	-1.109	0.268
CSCWO	0.069	0.038	0.104	1.810	0.070
COLLMC	-0.012	0.025	-0.012	-0.483	0.629
COLLLC	-0.004	0.022	-0.004	-0.168	0.866
MAJENG	-0.022	0.014	-0.039	-1.531	0.126
MAJMSCI	-0.008	0.016	-0.012	-0.475	0.635
MAJBSCI	-0.025	0.020	-0.031	-1.231	0.219
MAJHUM	0.032	0.021	0.038	1.525	0.128
MAJOTH	-0.022	0.034	-0.016	-0.662	0.508
MARRIED	-0.016	0.013	-0.035	-1.285	0.199
SHIPFFG	0.012	0.018	0.021	0.684	0.494
SHIPCG	-0.016	0.016	-0.027	-1.036	0.300
SHIPAMP	0.032	0.015	0.062	2.128	0.033
SHIPOTH	0.100	0.031	0.081	3.241	0.001
PORTGJAP	-0.020	0.018	-0.030	-1.145	0.252
PORTPRL	0.000	0.022	0.000	0.013	0.990
PORTSDG	-0.014	0.013	-0.029	-1.081	0.280
PORTWAS	-0.055	0.029	-0.048	-1.926	0.054
PORTFTI	-0.008	0.019	-0.012	-0.405	0.685
DEPCS	0.010	0.019	0.019	0.550	0.582
DEPNAV	-0.048	0.073	-0.016	-0.665	0.506
DEPOPS	0.004	0.017	0.007	0.209	0.834
DEPENG	0.039	0.017	0.082	2.350	0.019
DEPOTH	0.053	0.022	0.075	2.373	0.018
OODUQUAL	-0.039	0.011	-0.090	-3.735	0.000

Model Summary

Model		R	R Square	Adjusted R Square	Std. Error of the Estimate
	1	.259	.067	.047	.211

ANOVA Table

	Sum of Squares	df	Mean Square	F	Sig.
Regression	5	36	.150	3.385	.000
Residual	75	1697	.044		

Table A.6

OLS MODELS OF RULES OF THE ROAD: Mean Score

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	91.137	0.597		152.711	0.000
AGE2021	1.320	0.566	0.051	2.333	0.020
AGE2429	-0.705	0.506	-0.039	-1.394	0.164
AGE30PL	-0.924	0.914	-0.038	-1.011	0.312
FEMALE	-0.501	0.420	-0.026	-1.191	0.234
ETHBLK	-3.515	0.592	-0.127	-5.941	0.000
ETHHIS	-1.737	0.709	-0.051	-2.449	0.014
ETHASN	-1.245	0.705	-0.037	-1.766	0.078
ETHOTH	-0.484	0.920	-0.011	-0.526	0.599
CSNROTC	0.007	0.457	0.000	0.016	0.988
CSOCS	-0.590	0.534	-0.033	-1.104	0.270
CSECP	2.207	0.925	0.059	2.385	0.017
CSLDO	2.650	1.161	0.079	2.282	0.023
CSCWO	-3.507	1.330	-0.126	-2.637	0.008
COLLMC	3.026	0.827	0.078	3.658	0.000
COLLLC	-0.976	0.683	-0.031	-1.428	0.153
MAJENG	1.961	0.469	0.093	4.177	0.000
MAJMSCI	0.681	0.511	0.029	1.333	0.183
MAJBSCI	1.871	0.702	0.057	2.664	0.008
MAJHUM	0.919	0.672	0.030	1.369	0.171
MAJOTH	-0.097	1.042	-0.002	-0.093	0.926
MARRIED	0.824	0.410	0.048	2.011	0.044
SHIPFFG	-0.838	0.586	-0.036	-1.428	0.153
SHIPCG	-0.112	0.510	-0.005	-0.220	0.826
SHIPAMP	0.277	0.477	0.015	0.580	0.562
SHIPOTH	1.508	0.971	0.034	1.553	0.121
PORTGJAP	1.252	0.571	0.050	2.194	0.028
PORTPRL	1.459	0.711	0.046	2.052	0.040
PORTSDG	0.925	0.418	0.052	2.214	0.027
PORTWAS	1.976	0.960	0.045	2.059	0.040
PORTFTI	1.928	0.615	0.079	3.134	0.002
DEPCS	-0.040	0.599	-0.002	-0.066	0.947
DEPNAV	0.172	2.232	0.002	0.077	0.939
DEPOPS	-1.008	0.538	-0.055	-1.872	0.061
DEPENG	-0.037	0.534	-0.002	-0.069	0.945
DEPOTH	-2.447	0.735	-0.090	-3.329	0.001

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.290	.084	.070	.290

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	12158	35	347	5.727	.000
Residual	132235	2180	61		
Total	144394	2215			

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	90.038	0.617		145.957	0.000
AGE2021	1.243	0.561	0.048	2.216	0.027
AGE2429	-0.623	0.502	-0.034	-1.242	0.215
AGE30PL	-0.893	0.906	-0.037	-0.986	0.324
FEMALE	-0.544	0.417	-0.028	-1.307	0.192
ETHBLK	-3.339	0.587	-0.121	-5.687	0.000
ETHHIS	-1.665	0.703	-0.049	-2.368	0.018
ETHASN	-1.115	0.699	-0.033	-1.595	0.111
ETHOTH	-0.547	0.912	-0.012	-0.599	0.549
CSNROTC	0.092	0.453	0.005	0.204	0.838
CSOCS	-0.471	0.530	-0.027	-0.888	0.374
CSECP	2.114	0.917	0.057	2.305	0.021
CSLDO	2.684	1.151	0.080	2.332	0.020
CSCWO	-3.991	1.320	-0.143	-3.023	0.003
COLLMC	3.056	0.820	0.079	3.726	0.000
COLLLC	-1.036	0.677	-0.033	-1.530	0.126
MAJENG	1.910	0.465	0.090	4.104	0.000
MAJMSCI	0.635	0.507	0.027	1.252	0.211
MAJBSCI	1.877	0.696	0.058	2.697	0.007
MAJHUM	0.800	0.666	0.026	1.201	0.230
MAJOTH	-0.069	1.033	-0.001	-0.067	0.947
MARRIED	0.802	0.406	0.047	1.976	0.048
SHIPFFG	-0.839	0.581	-0.036	-1.444	0.149
SHIPCG	-0.109	0.506	-0.005	-0.215	0.830
SHIPAMP	0.428	0.474	0.022	0.903	0.367
SHIPOTH	1.252	0.963	0.028	1.299	0.194
PORTGJAP	0.931	0.568	0.037	1.640	0.101
PORTPRL	1.527	0.705	0.048	2.167	0.030
PORTSDG	0.880	0.414	0.050	2.126	0.034
PORTWAS	1.926	0.951	0.044	2.025	0.043
PORTFTI	1.881	0.610	0.077	3.085	0.002
DEPCS	-0.011	0.594	-0.001	-0.019	0.985
DEPNAV	0.402	2.213	0.004	0.182	0.856
DEPOPS	-1.034	0.534	-0.056	-1.938	0.053
DEPENG	-0.110	0.529	-0.006	-0.207	0.836
DEPOTH	-2.552	0.729	-0.094	-3.502	0.000
OODUQUAL	2.117	0.337	0.131	6.289	0.000

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.317	.101	.086	7.720

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	14516	36	403	6.765	.000
Residual	129878	2179	60		
Total	144394	2215			

Table A.7

OLS MODELS OF RULES OF THE ROAD: Probability of Failing Exam

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	0.316	0.034		9.201	0.000
AGE2021	-0.067	0.033	-0.045	-2.050	0.040
AGE2429	0.044	0.029	0.042	1.496	0.135
AGE30PL	0.034	0.053	0.025	0.648	0.517
FEMALE	0.011	0.024	0.010	0.451	0.652
ETHBLK	0.160	0.034	0.103	4.705	0.000
ETHHIS	0.100	0.041	0.052	2.443	0.015
ETHASN	0.055	0.041	0.029	1.363	0.173
ETHOTH	0.013	0.053	0.005	0.245	0.806
CSNROTC	-0.007	0.026	-0.007	-0.255	0.799
CSOCS	0.020	0.031	0.020	0.664	0.507
CSECP	-0.131	0.053	-0.062	-2.461	0.014
CSLDO	-0.065	0.067	-0.034	-0.979	0.328
CSCWO	0.095	0.076	0.060	1.240	0.215
COLLMC	-0.133	0.048	-0.061	-2.793	0.005
COLLLC	0.005	0.039	0.003	0.125	0.901
MAJENG	-0.062	0.027	-0.052	-2.303	0.021
MAJMSCI	-0.002	0.029	-0.001	-0.067	0.947
MAJBSCI	-0.090	0.040	-0.049	-2.225	0.026
MAJHUM	-0.009	0.039	-0.005	-0.228	0.820
MAJOTH	0.074	0.060	0.026	1.236	0.216
MARRIED	-0.049	0.024	-0.050	-2.078	0.038
SHIPFFG	0.023	0.034	0.018	0.687	0.492
SHIPCG	-0.004	0.029	-0.003	-0.129	0.897
SHIPAMP	-0.011	0.027	-0.010	-0.408	0.683
SHIPOTH	-0.064	0.056	-0.025	-1.144	0.253
PORTGJAP	-0.054	0.033	-0.038	-1.638	0.102
PORTPRL	-0.124	0.041	-0.069	-3.030	0.002
PORTSDG	-0.058	0.024	-0.058	-2.395	0.017
PORTWAS	-0.111	0.055	-0.045	-2.011	0.044
PORTFTI	-0.069	0.035	-0.050	-1.962	0.050
DEPCS	-0.012	0.034	-0.010	-0.334	0.739
DEPNAV	0.056	0.128	0.009	0.440	0.660
DEPOPS	0.065	0.031	0.062	2.088	0.037
DEPENG	0.006	0.031	0.006	0.186	0.852
DEPOTH	0.091	0.042	0.060	2.162	0.031

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.229	.052	.037	.448

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	24.195	35	.691	3.444	.000
Residual	437.610	2180	.201		
Total	461.805	2215			

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	0.375	0.036		10.570	0.000
AGE2021	-0.063	0.032	-0.043	-1.937	0.053
AGE2429	0.039	0.029	0.038	1.353	0.176
AGE30PL	0.032	0.052	0.024	0.620	0.535
FEMALE	0.013	0.024	0.012	0.553	0.580
ETHBLK	0.151	0.034	0.096	4.454	0.000
ETHHIS	0.096	0.040	0.050	2.365	0.018
ETHASN	0.048	0.040	0.025	1.198	0.231
ETHOTH	0.016	0.053	0.007	0.311	0.756
CSNROTC	-0.011	0.026	-0.011	-0.434	0.664
CSOCS	0.014	0.031	0.014	0.458	0.647
CSECP	-0.126	0.053	-0.060	-2.385	0.017
CSLDO	-0.067	0.066	-0.035	-1.015	0.310
CSCWO	0.121	0.076	0.077	1.593	0.111
COLLMC	-0.135	0.047	-0.061	-2.849	0.004
COLLLC	0.008	0.039	0.005	0.209	0.834
MAJENG	-0.059	0.027	-0.050	-2.218	0.027
MAJMSCI	0.001	0.029	0.000	0.019	0.985
MAJBSCI	-0.090	0.040	-0.049	-2.252	0.024
MAJHUM	-0.002	0.038	-0.001	-0.060	0.952
MAJOTH	0.073	0.059	0.026	1.221	0.222
MARRIED	-0.048	0.023	-0.049	-2.044	0.041
SHIPFFG	0.023	0.033	0.018	0.695	0.487
SHIPCG	-0.004	0.029	-0.003	-0.137	0.891
SHIPAMP	-0.019	0.027	-0.018	-0.711	0.477
SHIPOTH	-0.050	0.055	-0.020	-0.902	0.367
PORTGJAP	-0.036	0.033	-0.025	-1.112	0.266
PORTPRL	-0.128	0.041	-0.071	-3.145	0.002
PORTSDG	-0.055	0.024	-0.055	-2.312	0.021
PORTWAS	-0.108	0.055	-0.043	-1.978	0.048
PORTFTI	-0.067	0.035	-0.048	-1.905	0.057
DEPCS	-0.013	0.034	-0.011	-0.382	0.703
DEPNAV	0.044	0.127	0.007	0.345	0.730
DEPOPS	0.066	0.031	0.063	2.151	0.032
DEPENG	0.010	0.030	0.010	0.317	0.752
DEPOTH	0.097	0.042	0.063	2.315	0.021
OODUQUAL	-0.115	0.019	-0.125	-5.919	0.000

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.260	.067	.052	.445

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	31.120	36	.864	4.374	.000
Residual	430.685	2179	.198		
Total	461.805	2215			

Table A.8

OLS MODELS OF NAVIGATION: Mean Score

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	79.949	1.300		61.521	0.000
AGE2021	-0.354	1.269	-0.009	-0.279	0.781
AGE2429	-1.996	1.028	-0.076	-1.942	0.052
AGE30PL	-7.051	2.164	-0.177	-3.259	0.001
FEMALE	-3.573	0.918	-0.125	-3.892	0.000
ETHBLK	-5.043	1.344	-0.118	-3.753	0.000
ETHHIS	-2.231	1.554	-0.044	-1.436	0.151
ETHASN	-1.947	1.598	-0.038	-1.218	0.223
ETHOTH	0.118	1.846	0.002	0.064	0.949
CSNROTC	-2.336	0.987	-0.086	-2.367	0.018
CSOCS	-2.622	1.111	-0.102	-2.359	0.019
CSECP	0.675	2.123	0.011	0.318	0.751
CSLDO	0.978	2.818	0.017	0.347	0.729
CSCWO	-9.503	3.143	-0.205	-3.023	0.003
COLLMC	2.890	1.805	0.051	1.602	0.110
COLLLC	-1.805	1.554	-0.037	-1.161	0.246
MAJENG	4.228	0.980	0.143	4.315	0.000
MAJMSCI	2.488	1.115	0.073	2.232	0.026
MAJBSCI	1.505	1.535	0.032	0.981	0.327
MAJHUM	3.763	1.420	0.084	2.651	0.008
MAJOTH	3.363	2.355	0.044	1.428	0.154
MARRIED	0.607	0.901	0.023	0.674	0.501
SHIPFFG	-1.516	1.305	-0.046	-1.161	0.246
SHIPCG	-4.448	1.177	-0.125	-3.780	0.000
SHIPAMP	0.477	1.032	0.017	0.462	0.644
SHIPOTH	-2.634	2.101	-0.041	-1.254	0.210
PORTGJAP	-0.152	1.193	-0.004	-0.127	0.899
PORTPRL	3.751	1.616	0.076	2.321	0.021
PORTSDG	1.772	0.923	0.068	1.921	0.055
PORTWAS	1.031	2.048	0.016	0.504	0.615
PORTFTI	2.163	1.358	0.062	1.592	0.112
DEPCS	1.654	1.330	0.052	1.244	0.214
DEPNAV	2.576	6.411	0.012	0.402	0.688
DEPOPS	0.794	1.180	0.029	0.673	0.501
DEPENG	0.395	1.167	0.015	0.338	0.735
DEPOTH	-0.205	1.550	-0.005	-0.132	0.895

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.462	.214	.182	10.796

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	27751	35	793	6.803	.000
Residual	102216	877	117		
Total	129967	912			

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	79.158	1.350		58.640	0.000
AGE2021	-0.295	1.267	-0.008	-0.233	0.816
AGE2429	-1.870	1.027	-0.071	-1.820	0.069
AGE30PL	-6.993	2.160	-0.176	-3.238	0.001
FEMALE	-3.618	0.917	-0.126	-3.947	0.000
ETHBLK	-4.912	1.343	-0.115	-3.659	0.000
ETHHIS	-2.204	1.551	-0.044	-1.421	0.156
ETHASN	-1.789	1.597	-0.035	-1.121	0.263
ETHOTH	0.106	1.843	0.002	0.058	0.954
CSNROTC	-2.335	0.985	-0.086	-2.371	0.018
CSOCS	-2.680	1.110	-0.104	-2.415	0.016
CSECP	0.676	2.119	0.011	0.319	0.750
CSLDO	1.192	2.814	0.021	0.424	0.672
CSCWO	-9.874	3.142	-0.213	-3.142	0.002
COLLMC	2.881	1.801	0.051	1.599	0.110
COLLLC	-1.749	1.552	-0.036	-1.127	0.260
MAJENG	4.162	0.978	0.140	4.254	0.000
MAJMSCI	2.377	1.114	0.070	2.134	0.033
MAJBSCI	1.388	1.533	0.029	0.905	0.366
MAJHUM	3.638	1.418	0.082	2.565	0.010
MAJOTH	3.295	2.350	0.043	1.402	0.161
MARRIED	0.564	0.900	0.022	0.627	0.531
SHIPFFG	-1.581	1.303	-0.048	-1.213	0.225
SHIPCG	-4.345	1.175	-0.122	-3.697	0.000
SHIPAMP	0.521	1.030	0.019	0.506	0.613
SHIPOTH	-2.757	2.098	-0.042	-1.314	0.189
PORTGJAP	-0.417	1.197	-0.012	-0.348	0.728
PORTPRL	3.598	1.614	0.073	2.229	0.026
PORTSDG	1.730	0.921	0.067	1.879	0.061
PORTWAS	1.317	2.048	0.021	0.643	0.520
PORTFTI	2.248	1.356	0.065	1.657	0.098
DEPCS	1.626	1.327	0.051	1.225	0.221
DEPNAV	2.297	6.400	0.011	0.359	0.720
DEPOPS	0.771	1.178	0.028	0.655	0.513
DEPENG	0.369	1.165	0.014	0.317	0.751
DEPOTH	-0.251	1.547	-0.007	-0.163	0.871
OODUQUAL	1.552	0.734	0.065	2.114	0.035

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.466	.218	.185	10.775

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	28270	36	785	6.764	.000
Residual	101697	876	116		
Total	129967	912			

Table A.9

OLS MODELS OF NAVIGATION: Probability of Failing Exam

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	0.211	0.051		4.157	0.000
AGE2021	0.055	0.050	0.037	1.112	0.266
AGE2429	0.078	0.040	0.078	1.929	0.054
AGE30PL	0.221	0.085	0.146	2.606	0.009
FEMALE	0.053	0.036	0.049	1.473	0.141
ETHBLK	0.222	0.053	0.137	4.221	0.000
ETHHIS	0.110	0.061	0.058	1.816	0.070
ETHASN	0.127	0.062	0.065	2.031	0.043
ETHOTH	-0.048	0.072	-0.021	-0.665	0.506
CSNROTC	0.084	0.039	0.081	2.167	0.030
CSOCS	0.084	0.043	0.085	1.921	0.055
CSECP	0.062	0.083	0.027	0.743	0.458
CSLDO	0.006	0.110	0.003	0.055	0.956
CSCWO	0.298	0.123	0.169	2.426	0.015
COLLMC	-0.106	0.071	-0.049	-1.500	0.134
COLLLC	0.081	0.061	0.044	1.330	0.184
MAJENG	-0.140	0.038	-0.124	-3.649	0.000
MAJMSCI	-0.097	0.044	-0.075	-2.227	0.026
MAJBSCI	0.024	0.060	0.013	0.393	0.694
MAJHUM	-0.057	0.056	-0.034	-1.035	0.301
MAJOTH	-0.078	0.092	-0.027	-0.847	0.397
MARRIED	-0.034	0.035	-0.035	-0.970	0.332
SHIPFFG	-0.005	0.051	-0.004	-0.096	0.924
SHIPCG	0.109	0.046	0.081	2.363	0.018
SHIPAMP	-0.018	0.040	-0.018	-0.457	0.648
SHIPOTH	0.121	0.082	0.049	1.467	0.143
PORTGJAP	-0.017	0.047	-0.013	-0.375	0.708
PORTPRL	-0.096	0.063	-0.051	-1.521	0.129
PORTSDG	-0.072	0.036	-0.073	-1.997	0.046
PORTWAS	-0.008	0.080	-0.003	-0.101	0.920
PORTFTI	-0.048	0.053	-0.036	-0.903	0.367
DEPCS	-0.035	0.052	-0.030	-0.682	0.496
DEPNAV	0.130	0.251	0.016	0.518	0.604
DEPOPS	0.003	0.046	0.003	0.073	0.942
DEPENG	-0.015	0.046	-0.015	-0.337	0.736
DEPOTH	0.012	0.061	0.008	0.203	0.839

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.404	.163	.130	.422

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	30.525	35	.872	4.894	.000
Residual	156.290	877	.178		
Total	186.815	912			

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	0.215	0.053		4.062	0.000
AGE2021	0.055	0.050	0.037	1.106	0.269
AGE2429	0.077	0.040	0.077	1.910	0.056
AGE30PL	0.220	0.085	0.146	2.601	0.009
FEMALE	0.053	0.036	0.049	1.478	0.140
ETHBLK	0.221	0.053	0.137	4.202	0.000
ETHHIS	0.110	0.061	0.058	1.813	0.070
ETHASN	0.126	0.063	0.065	2.016	0.044
ETHOTH	-0.048	0.072	-0.021	-0.664	0.507
CSNROTC	0.084	0.039	0.081	2.166	0.031
CSOCS	0.084	0.043	0.086	1.926	0.054
CSECP	0.062	0.083	0.027	0.743	0.458
CSLDO	0.005	0.110	0.002	0.045	0.964
CSCWO	0.300	0.123	0.170	2.435	0.015
COLLMC	-0.106	0.071	-0.049	-1.498	0.134
COLLLC	0.081	0.061	0.043	1.325	0.185
MAJENG	-0.139	0.038	-0.124	-3.637	0.000
MAJMSCI	-0.097	0.044	-0.075	-2.212	0.027
MAJBSCI	0.024	0.060	0.013	0.402	0.688
MAJHUM	-0.057	0.056	-0.034	-1.023	0.306
MAJOTH	-0.078	0.092	-0.027	-0.843	0.399
MARRIED	-0.034	0.035	-0.035	-0.964	0.335
SHIPFFG	-0.005	0.051	-0.004	-0.090	0.928
SHIPCG	0.108	0.046	0.080	2.350	0.019
SHIPAMP	-0.019	0.040	-0.018	-0.462	0.645
SHIPOTH	0.121	0.082	0.049	1.473	0.141
PORTGJAP	-0.016	0.047	-0.012	-0.346	0.729
PORTPRL	-0.095	0.063	-0.051	-1.508	0.132
PORTSDG	-0.072	0.036	-0.073	-1.990	0.047
PORTWAS	-0.009	0.080	-0.004	-0.117	0.907
PORTFTI	-0.048	0.053	-0.037	-0.910	0.363
DEPCS	-0.035	0.052	-0.029	-0.679	0.498
DEPNAV	0.131	0.251	0.017	0.523	0.601
DEPOPS	0.003	0.046	0.003	0.075	0.940
DEPENG	-0.015	0.046	-0.015	-0.334	0.738
DEPOTH	0.013	0.061	0.009	0.206	0.837
OODUQUAL	-0.007	0.029	-0.008	-0.253	0.801

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.404	.163	.129	.422

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	30.536	36	.848	4.755	.000
Residual	156.278	876	.178		
Total	186.815	912			

Table A.10

OLS MODELS OF FINAL EXAM: Mean Score

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	83.280	1.185		70.307	0.000
AGE2021	1.360	1.158	0.054	1.175	0.241
AGE2429	-1.847	1.001	-0.105	-1.845	0.066
AGE30PL	-5.070	2.082	-0.119	-2.435	0.015
FEMALE	0.196	0.848	0.011	0.232	0.817
ETHBLK	-4.555	1.240	-0.167	-3.672	0.000
ETHHIS	-3.440	1.554	-0.098	-2.213	0.027
ETHASN	-1.019	1.520	-0.030	-0.671	0.503
ETHOTH	1.493	2.983	0.022	0.500	0.617
CSNROTC	-0.356	0.957	-0.020	-0.373	0.710
CSOCS	-0.157	1.037	-0.010	-0.152	0.880
CSECP	2.149	2.564	0.040	0.838	0.402
COLLMC	1.677	1.762	0.042	0.952	0.342
COLLLC	-3.305	1.257	-0.123	-2.630	0.009
MAJENG	2.304	0.999	0.108	2.306	0.022
MAJMSCI	1.445	1.030	0.065	1.402	0.161
MAJBSCI	0.277	2.028	0.006	0.136	0.892
MAJHUM	-1.999	1.387	-0.066	-1.441	0.150
MAJOTH	0.114	1.948	0.003	0.058	0.953
MARRIED	-0.180	0.875	-0.010	-0.205	0.838
SHIPFFG	-0.953	1.302	-0.037	-0.732	0.464
SHIPCG	-0.336	1.083	-0.015	-0.311	0.756
SHIPAMP	0.230	0.993	0.012	0.232	0.817
SHIPOTH	-4.668	1.898	-0.115	-2.460	0.014
PORTGJAP	-0.777	1.172	-0.032	-0.663	0.508
PORTPRL	1.113	1.382	0.039	0.806	0.421
PORTSDG	2.028	0.899	0.115	2.256	0.025
PORTWAS	2.083	2.263	0.043	0.921	0.358
PORTFTI	-0.425	1.451	-0.014	-0.293	0.770
DEPCS	-0.233	1.211	-0.011	-0.192	0.848
DEPNAV	-3.200	4.017	-0.036	-0.797	0.426
DEPOPS	0.794	1.082	0.043	0.734	0.463
DEPENG	0.906	1.072	0.051	0.846	0.398
DEPOTH	-4.136	1.626	-0.135	-2.544	0.011

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.429	.184	.124	7.566

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	5779	33	175	3.059	.000
Residual	25589	447	57		
Total	31368	480			

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	82.505	1.195		69.065	0.000
AGE2021	1.311	1.145	0.052	1.144	0.253
AGE2429	-1.796	0.990	-0.102	-1.814	0.070
AGE30PL	-5.067	2.059	-0.119	-2.461	0.014
FEMALE	-0.006	0.841	0.000	-0.007	0.994
ETHBLK	-4.160	1.232	-0.153	-3.375	0.001
ETHHIS	-3.367	1.537	-0.096	-2.190	0.029
ETHASN	-1.015	1.504	-0.030	-0.675	0.500
ETHOTH	1.761	2.952	0.026	0.597	0.551
CSNROTC	-0.245	0.947	-0.014	-0.258	0.796
CSOCS	0.023	1.027	0.001	0.022	0.982
CSECP	1.999	2.536	0.037	0.788	0.431
COLLMC	1.545	1.743	0.039	0.886	0.376
COLLLC	-3.622	1.247	-0.134	-2.905	0.004
MAJENG	2.273	0.988	0.107	2.299	0.022
MAJMSCI	1.330	1.019	0.060	1.304	0.193
MAJBSCI	1.107	2.021	0.025	0.548	0.584
MAJHUM	-2.339	1.376	-0.077	-1.700	0.090
MAJOTH	0.124	1.927	0.003	0.065	0.949
MARRIED	-0.230	0.866	-0.013	-0.265	0.791
SHIPFFG	-1.428	1.295	-0.055	-1.102	0.271
SHIPCG	-0.411	1.071	-0.018	-0.384	0.702
SHIPAMP	0.242	0.982	0.013	0.247	0.805
SHIPOTH	-5.204	1.884	-0.129	-2.763	0.006
PORTGJAP	-0.880	1.159	-0.037	-0.759	0.448
PORTPRL	1.207	1.367	0.042	0.883	0.378
PORTSDG	1.983	0.890	0.113	2.229	0.026
PORTWAS	1.725	2.240	0.036	0.770	0.442
PORTFTI	-0.050	1.439	-0.002	-0.035	0.972
DEPCS	-0.034	1.199	-0.002	-0.028	0.978
DEPNAV	-2.717	3.976	-0.031	-0.683	0.495
DEPOPS	0.669	1.071	0.036	0.625	0.532
DEPENG	0.833	1.060	0.047	0.785	0.433
DEPOTH	-4.241	1.608	-0.138	-2.637	0.009
OODUQUAL	2.490	0.751	0.146	3.316	0.001

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.452	.204	.143	7.483

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	6395	34	188	3.359	.000
Residual	24973	446	56		
Total	31368	480			

Table A.11

OLS MODELS OF FINAL EXAM: Probability of Failing Exam

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	0.026	0.043		0.606	0.545
AGE2021	-0.032	0.042	-0.036	-0.766	0.444
AGE2429	0.006	0.036	0.010	0.163	0.871
AGE30PL	0.217	0.073	0.150	2.959	0.003
FEMALE	0.003	0.031	0.004	0.086	0.932
ETHBLK	0.143	0.045	0.150	3.185	0.002
ETHHIS	0.181	0.055	0.150	3.285	0.001
ETHASN	0.074	0.055	0.062	1.342	0.180
ETHOTH	0.047	0.108	0.020	0.440	0.660
CSNROTC	0.049	0.035	0.079	1.423	0.155
CSOCS	0.023	0.037	0.040	0.614	0.539
CSECP	-0.022	0.093	-0.012	-0.236	0.814
COLLMC	0.022	0.064	0.016	0.350	0.727
COLLLC	0.067	0.045	0.072	1.487	0.138
MAJENG	-0.036	0.036	-0.048	-0.989	0.323
MAJMSCI	-0.009	0.037	-0.012	-0.249	0.803
MAJBSCI	-0.014	0.073	-0.009	-0.197	0.844
MAJHUM	-0.004	0.050	-0.004	-0.075	0.940
MAJOTH	-0.011	0.070	-0.007	-0.152	0.879
MARRIED	0.050	0.031	0.079	1.574	0.116
SHIPFFG	-0.064	0.047	-0.070	-1.357	0.175
SHIPCG	0.000	0.039	-0.001	-0.012	0.991
SHIPAMP	-0.035	0.036	-0.052	-0.966	0.334
SHIPOTH	0.141	0.068	0.100	2.063	0.040
PORTGJAP	0.000	0.042	0.001	0.011	0.991
PORTPRL	-0.003	0.050	-0.003	-0.068	0.945
PORTSDG	-0.030	0.032	-0.048	-0.912	0.362
PORTWAS	-0.017	0.082	-0.010	-0.203	0.840
PORTFTI	-0.010	0.052	-0.010	-0.197	0.844
DEPCS	0.052	0.044	0.068	1.190	0.235
DEPNAV	0.231	0.145	0.074	1.588	0.113
DEPOPS	-0.014	0.039	-0.021	-0.358	0.721
DEPENG	-0.007	0.039	-0.011	-0.179	0.858
DEPOTH	0.039	0.059	0.037	0.670	0.503

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.352	.124	.060	.273

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	4.764	33	.144	1.930	.002
Residual	33.584	449	.075		
Total	38.348	482			

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig. Level
	B	Std. Error	Beta		
(Constant)	0.043	0.043		0.989	0.323
AGE2021	-0.031	0.042	-0.035	-0.742	0.458
AGE2429	0.005	0.036	0.008	0.128	0.898
AGE30PL	0.215	0.073	0.149	2.947	0.003
FEMALE	0.007	0.031	0.011	0.236	0.814
ETHBLK	0.134	0.045	0.141	2.990	0.003
ETHHIS	0.179	0.055	0.148	3.250	0.001
ETHASN	0.074	0.055	0.062	1.344	0.179
ETHOTH	0.042	0.107	0.018	0.387	0.699
CSNROTC	0.047	0.034	0.075	1.354	0.176
CSOCS	0.019	0.037	0.033	0.508	0.611
CSECP	-0.018	0.092	-0.010	-0.197	0.844
COLLMC	0.025	0.063	0.018	0.399	0.690
COLLLC	0.074	0.045	0.079	1.634	0.103
MAJENG	-0.035	0.036	-0.047	-0.971	0.332
MAJMSCI	-0.007	0.037	-0.009	-0.190	0.849
MAJBSCI	-0.033	0.074	-0.021	-0.443	0.658
MAJHUM	0.004	0.050	0.003	0.074	0.941
MAJOTH	-0.011	0.070	-0.007	-0.156	0.876
MARRIED	0.051	0.031	0.081	1.626	0.105
SHIPFFG	-0.053	0.047	-0.059	-1.132	0.258
SHIPCG	0.001	0.039	0.001	0.024	0.981
SHIPAMP	-0.035	0.036	-0.052	-0.984	0.326
SHIPOTH	0.153	0.068	0.109	2.241	0.026
PORTGJAP	0.002	0.042	0.003	0.056	0.955
PORTPRL	-0.005	0.050	-0.005	-0.110	0.912
PORTSDG	-0.029	0.032	-0.047	-0.886	0.376
PORTWAS	-0.009	0.082	-0.005	-0.106	0.916
PORTFTI	-0.019	0.052	-0.018	-0.354	0.723
DEPCS	0.048	0.044	0.063	1.098	0.273
DEPNAV	0.220	0.145	0.071	1.522	0.129
DEPOPS	-0.011	0.039	-0.017	-0.287	0.774
DEPENG	-0.005	0.038	-0.008	-0.129	0.897
DEPOTH	0.042	0.058	0.039	0.719	0.473
OODUQUAL	-0.055	0.027	-0.092	-2.010	0.045

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.363	.132	.066	.273

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	5.064	34	.149	2.005	.001
Residual	33.284	448	.074		
Total	38.348	482			

Lists of References

Bowman, W.R., & Mehay, S.L. (2005). Marital Status and Productivity: Evidence from Personnel Data. *Southern Economic Journal,* 72(1), 63.77.

Bowman, W.R., & Crawford, A.M. (2011). *Report on the Performance of Junior Surface Warfare officers in Advanced Ship and Tactics (ASAT) Classroom Training Programs.* Naval Postgraduate School, Monterey, CA.

Crawford, A.M., & Stoker, C. (2010). *Process Evaluation of SWOS Division Officer Training.* Naval Postgraduate School, Monterey, CA.

Appendix A

Protocol for Ship Visits

On each ship, we would like to be able to meet with the following people as availability allows: 116X/111/X division officers (group 1), department heads (group 2), and members of the Chiefs' Mess (group 3). If possible, we would like an hour for each of these meetings. We would like to finish with an office call with the CO and/or XO.

The questions we want to ask everyone are:

1. Ideally, what needs to be in place to efficiently and effectively train a SWO JO—both in port and underway?
2. Please address the following factors:
    a. Expectations following ATG training
    b. In port vs. underway time
    c. Effects of ship type and home port
    d. Roles of senior enlisted, department heads, the senior watch officer, XO, and CO.
    e. Training climate
    f. Other? (When we do this kind of work, we go in with a set of questions but fully expect people we are interviewing to tell us other factors that we did not anticipate that impact good training. This is why we do interviews as opposed to surveys for this kind of work.)

Appendix B

USS CHUNG-HOON SWO University

Week 1 **Basic Damage Control**

Topics
Introduction to Damage Control
Safety Precautions
Communications
DC Organization
Repair Locker Walkthrough
Fire Team Composition
Watertight Enclosures/Hull Fittings
Installed Fire Extinguishing Equipment
AFFF
Firemain/Firepumps
Installed Drainage
Casualty Power
CBR Detection Equipment
Battle Damage Repair
Ventilation
Dewatering Equipment/Pumps
Pipe Repair/Patching
Plugging/Shoring
Classes of Fire/Causes
Conflagaration/ Conflag Station
EEBD/Egress/SCBA
Crash and Salvage Equipment
Basic First Aid
Dressing Wounds/Battle Dressing Training
Shipwide DC Equipment Walkthrough

Week 2 **Shiphandling/OOD Week**

Topics
Bridge Walkthrough
Navigation Equipment Familiarization
VMS/BME/SPS-67 Training
Rules of the Road Introduction
Man Overboard Procedures
Deck Seamanship
Deck Equipment
Underway Replenishment
Refueling Stations & Equipment
Anchoring
Towing
Mooring to a Buoy

Standard Commands
Watch Team Organization
Basic Shiphandling
UNREP Equipment Walkthrough
Sea & Anchor (to/from pier)
Flight Operations
Rules of the Road

CO's Roundtable (USS STARK Case Study)

Week 3 Weapons/ Combat Systems Week

Topics ATTWO/GLO Overview
Introduction to Aegis
CWC Concept
Radar Fundamentals
Antenna Familiarization
Radio/Telephone Procedures
Naval Communications
Wave Propagation
Radio Walkthrough
SLQ-32
SRBOC
NULKA
EW
SESS
Sound Propagation
Sonar
ASW Communications
ASW Organization
ASW Aircraft and Sonobuoy
ASW Tactics
Sonar Space Walkthrough
US Naval Assets
Naval Missiles
ASCM Defense
Naval Gun and Ammunition
Gunfire Control
Gun Mount and Magazine Walkthrough
Strike Warfare Overview

Week 4 Engineering Week

Topics Engineering Administration
GTM Overview
GTE Fuel Services
Main Space Familiarization
CPP

Fuel System
Pollution Control
Propulsion Cycle
Auxillary Equipment
A/C & Refrigeration Plant
Reverse Osmosis
RHIB
RAST
Low Pressure Air Compressors
Electrical Distribution
Switchboards
Degaussing
EPCC
Steering
CCS (Equipment and Watchstations)
Engineering Watch Organization
Main Space Walkthrough

CO's Roundtable (USS FORRESTAL Case Study)

Week 5 Mixed Bag Week

Topics
Supply Requisition Chain
OMMS-NG Familiarization
SKED
3M Basics
Spot Check Training
43P1
HAZMAT/HMUG/MSDS
EGL/IGL
Division Officer SORM Responsibilities
Division Officer Afloat PQS
FLTMPS
Division Officer Toolbox
TORIS/TFOM
Administrative Organization
Enlisted Evaluation and Advancement Systems
Zone Inspection

Week 6 CIC Week

Topics
Moboards
CIC Mission
CIC Publications, Logs and Administration
NSFS Mission and Organization
Standing the Watch (CICWO/SUWC)
DIVTACS/FLT TAC
Rules of the Road/MOBOARD/FLT TAC Practicals
CO's Roundtable (NASA: Space Shuttle Challenger Case Study)

SWO Candidate Watch Rotation 1700-2200 daily starting 01JUN11

Watch Station	SWO Candidate									
Watch Station Title	*Day 1*	*Day 2*	*Day 3*	*Day 4*	*Day 5*	*Day 6*	*Day 7*	*Day 8*	*Day 9*	*Day 10*
Bridge/JOOW	1	2	3	4	5	6	7	8	9	10
SUWC	2	3	4	5	6	7	8	9	10	1
CICWS	3	4	5	6	7	8	9	10	1	2
TIC	4	5	6	7	8	9	10	1	2	3
CSC	5	6	7	8	9	10	1	2	3	4
CCS/EOOW	6	7	8	9	10	1	2	3	4	5
S&S	7	8	9	10	1	2	3	4	5	6
ERO	8	9	10	1	2	3	4	5	6	7
OIL KING	9	10	1	2	3	4	5	6	7	8
SONAR SUPE	10	1	2	3	4	5	6	7	8	9

Note: Each SWO candidate will rotate daily through the course of the SWO University program. By design, the SWO Candidate will experience the different departments and divisions through the 2nd Tour Division Officers and Limited Duty Officers. SWO Candidates will attend Departmental Khaki Call and Quarters with their running mate and work within the division from 1200-1700 while underway daily.

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SWO Candidate Division Rotation starting 01JUN11

Division Officer/LDO		SWO Candidate					
Running Mate Title		*Week 1*	*Week 2*	*Week 3*	*Week 4*	*Week 5*	*Week 6*
NAV		1	2	3	4	5	6
CICO		2	3	4	5	6	1
DCA		3	4	5	6	1	2
TRAINO		4	5	6	1	2	3
MPA		5	6	1	2	3	4
FCO		6	1	2	3	4	5

Note: Each SWO candidate will rotate weekly through the course of the SWO University program. By design, the SWO Candidate will experience the different departments and divisions through the 2nd Tour Division Officers and Limited Duty Officers. SWO Candidates will attend Departmental Khaki Call and Quarters with their running mate and work within the division from 1200-1700 while underway daily.

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Initial Distribution List

1.	Defense Technical Information Center Ft. Belvoir, Virginia	1
2.	Dudley Knox Library Naval Postgraduate School Monterey, California	1
3.	Research Sponsored Programs Office, Code 41 Naval Postgraduate School Monterey, CA 93943	1
4.	William R. Bowman Visiting Professor	1
5.	Alice M. Crawford Associate Dean for Faculty Development	1
6.	William D. Hatch Lecturer/researcher/thesis advisor	1
7.	Captain Neil Parrot Commanding Officer Surface Warfare Officers School	1
8.	Captain Roy Kitchener CNSP COS	1
9.	Mr. Ted Serfass CNSP Deputy ACOS NTD	1
10.	Captain Matthew Beaver CNSL COS	1
11.	Mr. Sean Moriarty CNSL Deputy ACOS NTD	1